2 JUNE 1955 ONE SHILLING

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industrial motors

'CORRILUX'

—ideal lighting fitting for indoors—because of its excellent appearance;
and for outdoors—because the Corrilux is completely weatherproof,
will not corrode and is of great strength

LOWEST PRICED 23/6 100w BULKHEAD FITTING

Exceptional strength
body made of corrosion-resisting aluminium alloy, frosted finish

Excellent light distribution

Really attractive
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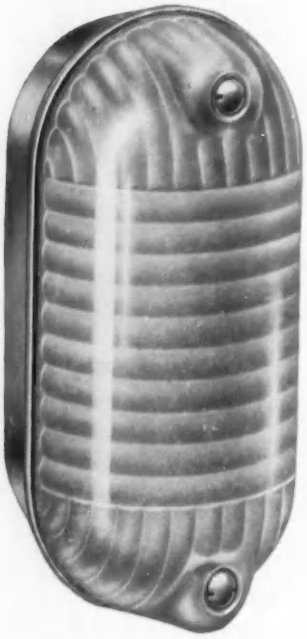
Better glass mounting
1-piece internally frosted glass of great strength, mounted on non-intercellular rubber gasket

2" centre knockouts
and 2 brick-width knockouts for fixing screws



Five ¾" knockout
conduit positions

Sealing compound
for conduit entry supplied with each fitting

BC lampholder
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Holds any lamp
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Surface or semi-recessed

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A suitable length of sleeving of glass fibre is supplied to protect cables.

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Aluminium Wire & Cable Co. Ltd. (AWCO) a member of The Aluminium Development Association, was formed to meet the need for a single organization to combine the technical development, production, stranding and marketing of aluminium and aluminium alloy wire. The company is the largest manufacturer of aluminium wire in Great Britain and its products are used for a vast range of applications both at home and in many countries overseas.

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JUNE 1st – JUNE 10th

This Exhibition is being organized by The Aluminium Development Association to mark the Centenary of Aluminium and to illustrate its progress from a semi-precious metal to its present position as second in volume of consumption amongst the world's industrial metals.

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Wiring System

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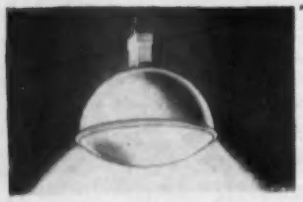

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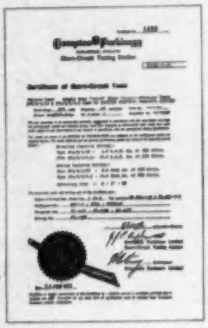
2,500 amps. at 250 volts A.C.



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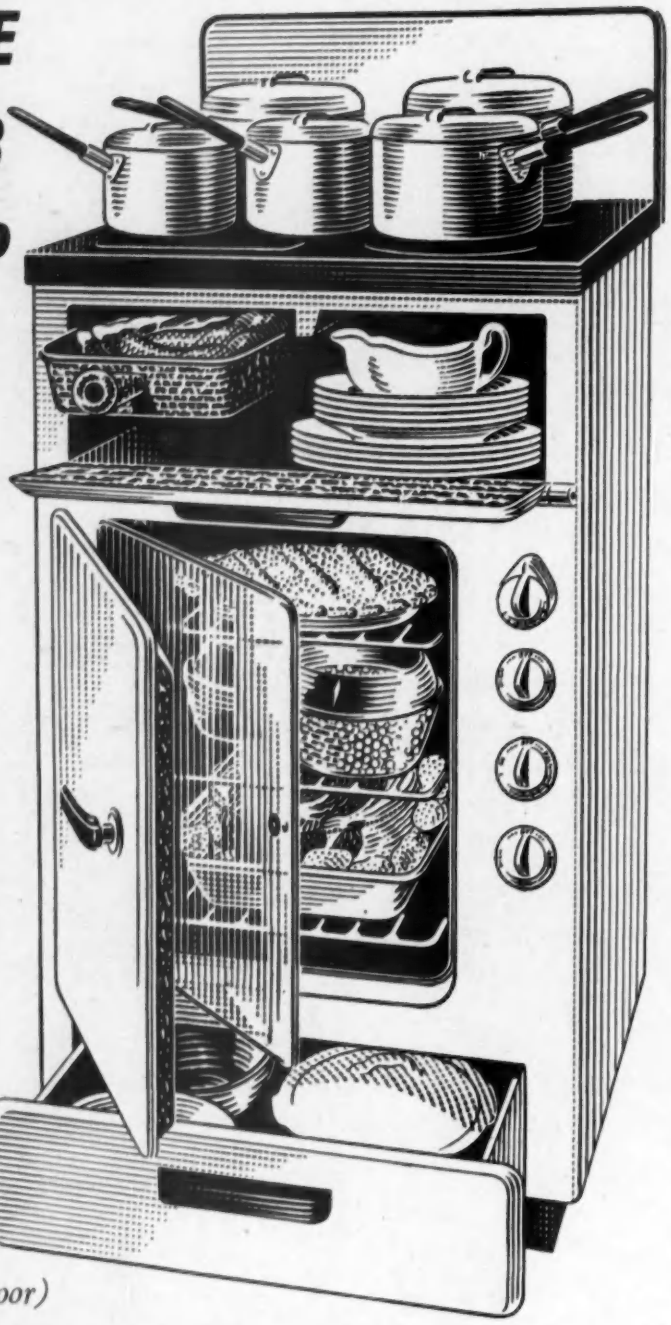

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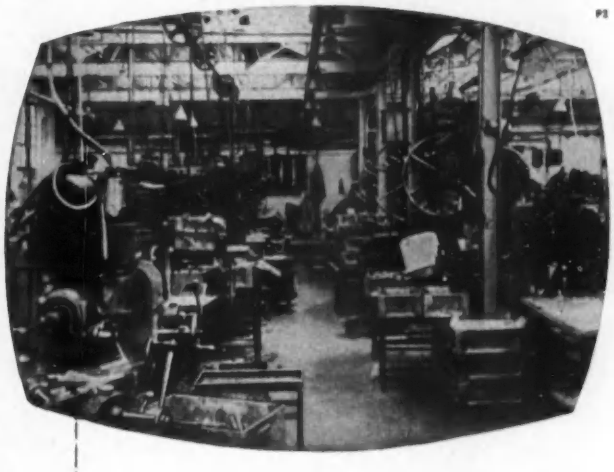

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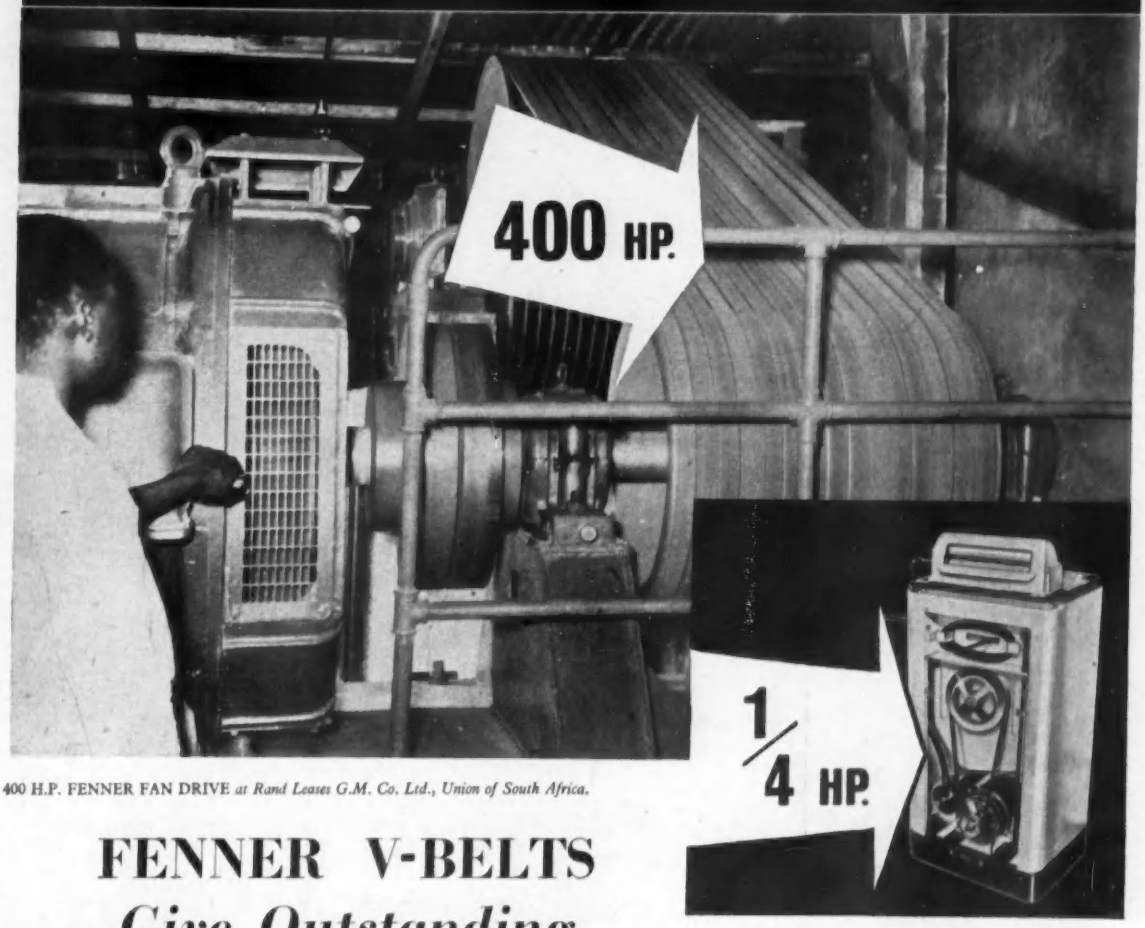

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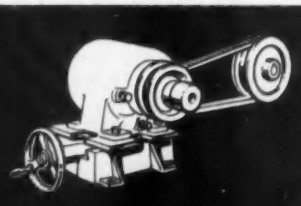

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A simple method for selecting the "Speed you need." Will convert any standard Constant Speed Motor into a Variable Speed Drive. Send for full information.

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Thanking you.

We remain,

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per: A. COLLINS.

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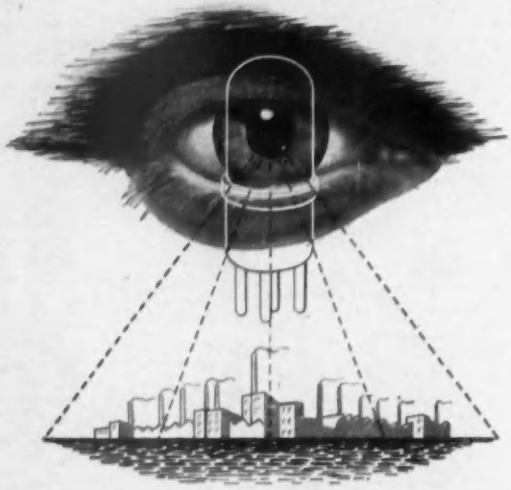

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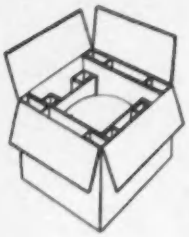

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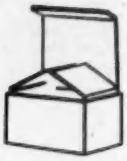

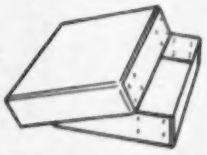

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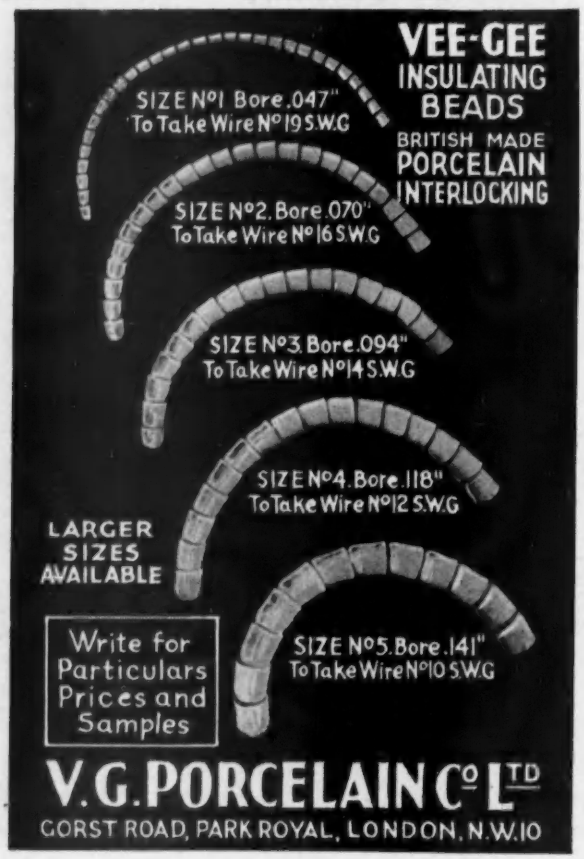
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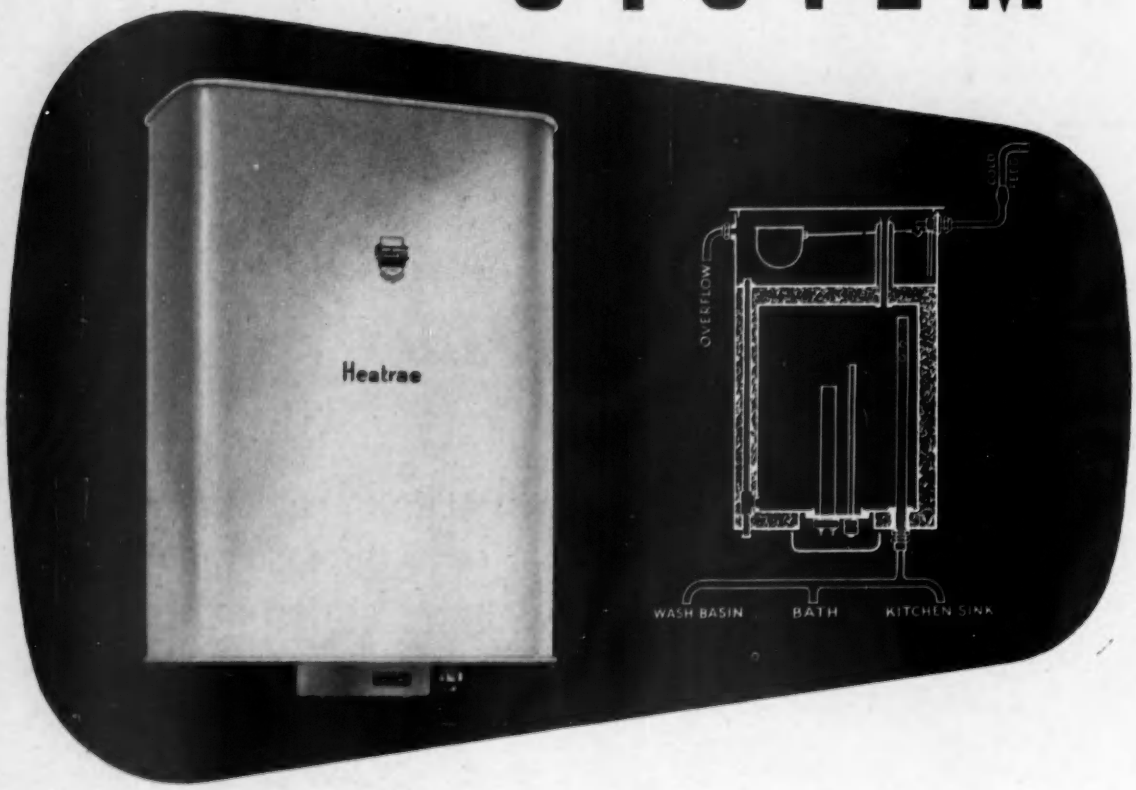

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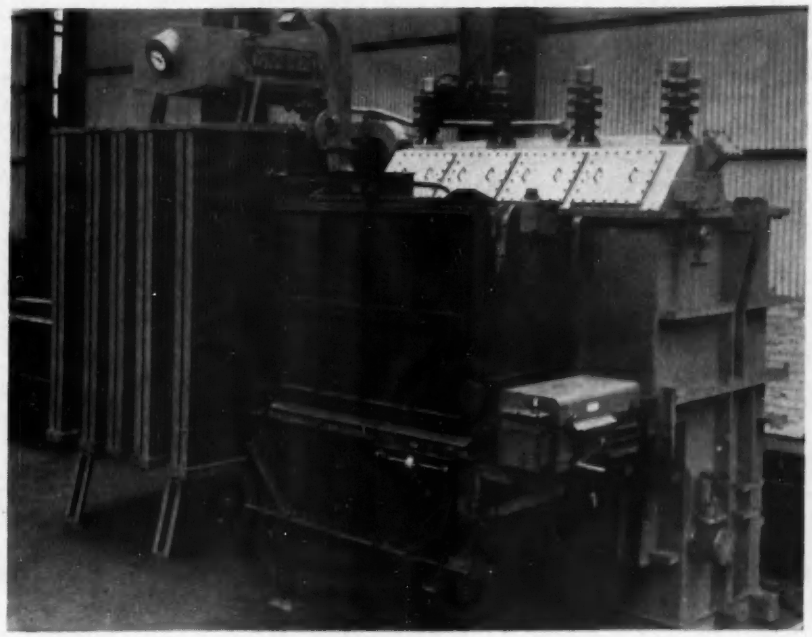

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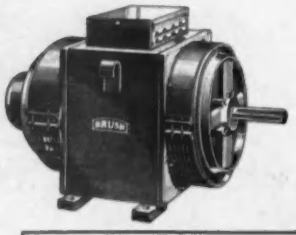

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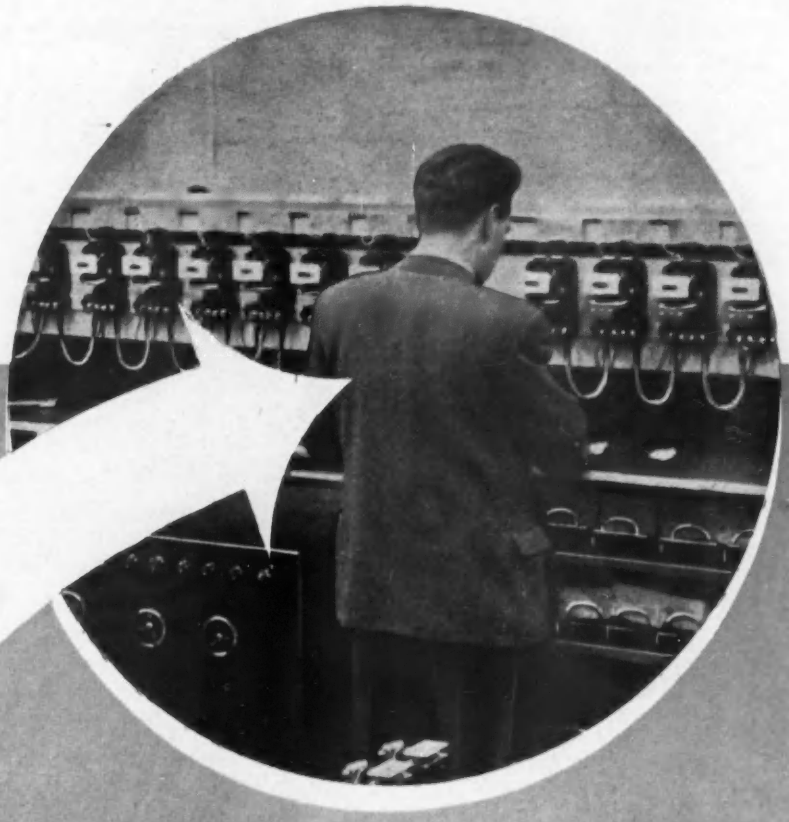

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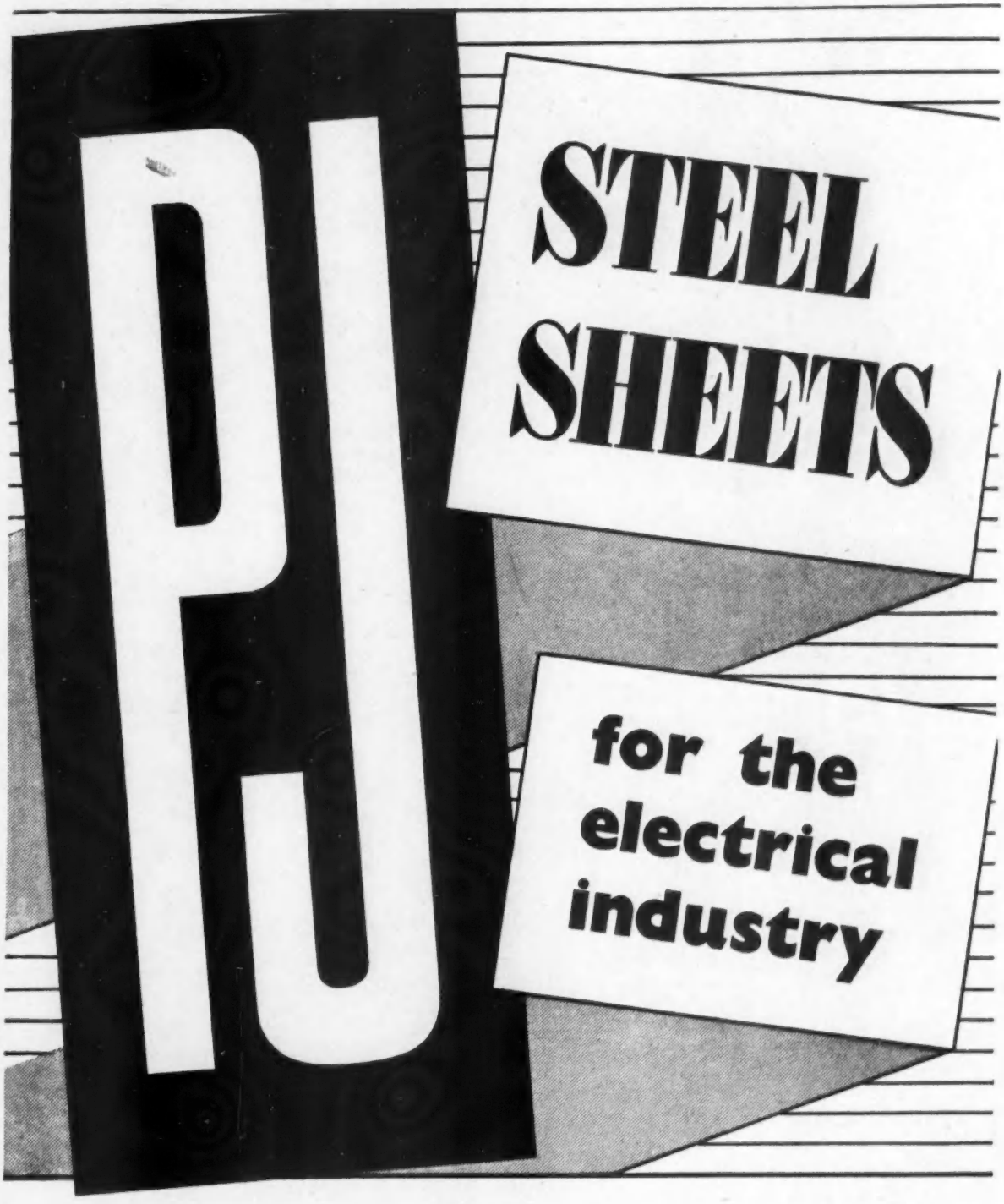

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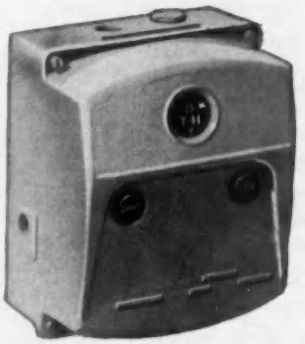

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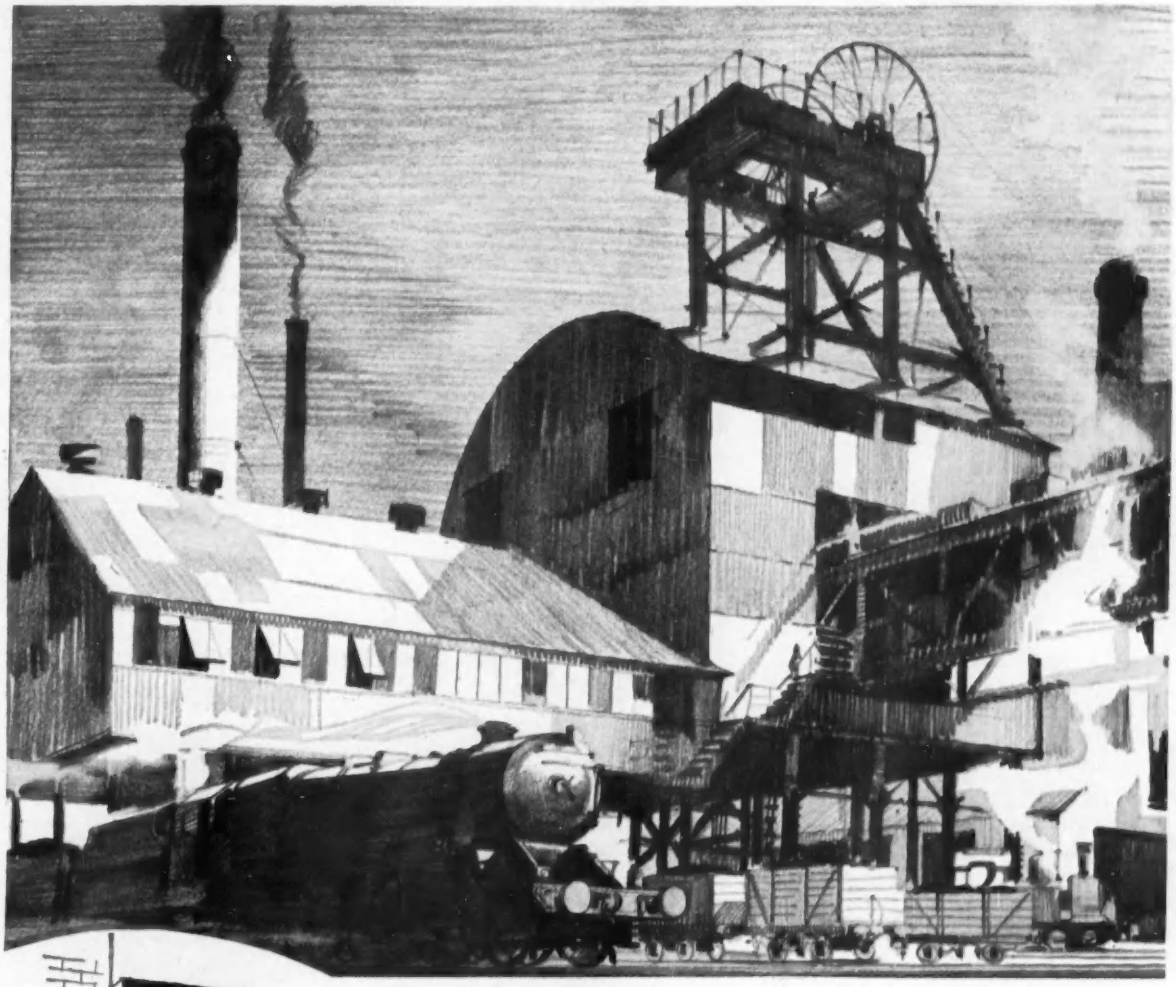

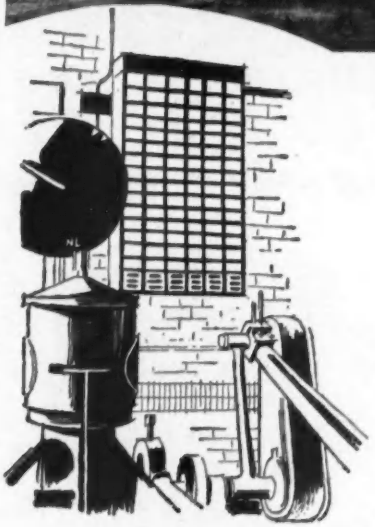

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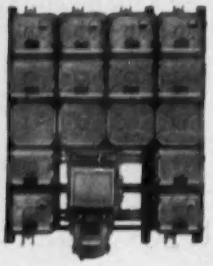
A triple pole 30 amp. Circuit Breaker with core balance transformer and E.L. relay



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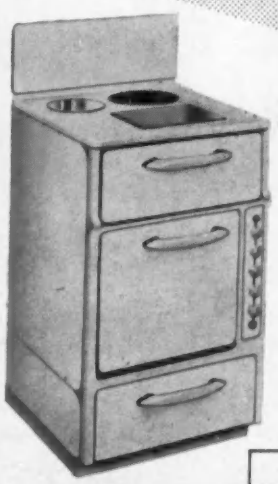
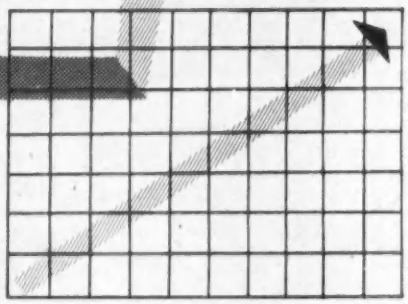
A Graphic Story...

THE B.N.E. C.90 COOKER



SPEEDHEAT OVEN BOOSTS SALES

Here's a feature that will impress your customers — a cooker with an oven that saves time and money. Show them the C.90 pre-heating graph and you'll find your sales graph reaching new heights.

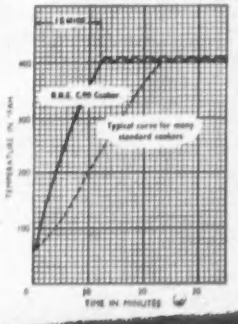


WATCH SALES SOAR with this SPEEDHEAT OVEN

Here's the point! At a loading of only 2,500 watts the oven will reach 400°F. in 12 minutes — half the time of many standard models. Compare this with the higher loadings and longer times of many other cookers and the saving is obvious.

The B.N.E. C.90 Cooker challenges comparison with more expensive models. Consider these features. An exclusive Pyrex casserole/grill pan. Drop-down counter-balanced doors with large insulated easy-grip handles. Heated storage drawer. 8" radiant plate, and NO extras. All for the very moderate price of £50-18-0.

THE C.90 SPEEDHEAT PRE-HEATING GRAPH



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A B.N.E. Product

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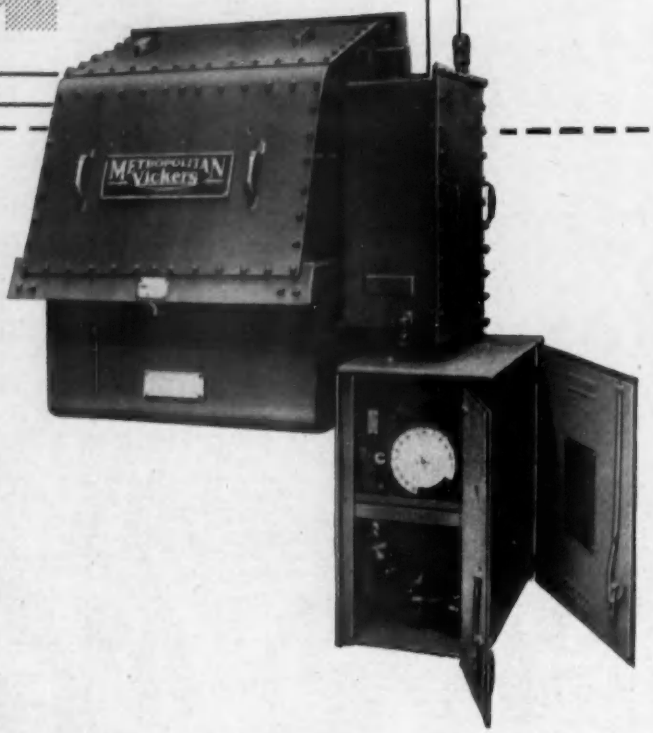
The Domestic Appliance Section of JOHNSON & PHILLIPS LTD
NEWARTHILL · MOTHERWELL · SCOTLAND

On-load Tap Changers

TYPE M



Designed for use on transformers of up to 275 kV, the Type M tap changer has a simple and reliable operating mechanism which ensures completion of tap change. Transition resistors—liberally rated and mechanically robust—minimize arcing and burning at the contacts of the diverter switches, and ease the switching duty. The complete tap changer with its motor driving gear is compactly assembled as a single, iron-clad unit and bolted to a flange on the transformer tank.

Other important features:

- *Any number of steps up to 18 can be accommodated*
- *Once initiated, a tap change cannot be interrupted*
- *Continuity of supply maintained during a tap change*
- *Separate drop-down tank allows convenient inspection of diverter switches*
- *Diverter switches are rapid in operation*
- *Contact bounce at diverter switches eliminated*
- *Minimum voltage variation during a tap change*
- *Moving contacts have single bolt fixing and are accessible from the front.*

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Cat. No.	Price	Page	Cat. No.	Price	Page	Cat. No.	Price	Page	Cat. No.	Price	Page
651	3/8 Each	14	1301	7/– Doz.	14 (a)	4095	40/– Doz.	12	5116	19/– Doz.	7
653	8/– ,,	14	1302	7/– ,,	14 (a)	4096	46/– ,,	12	5117	27/– ,,	7
0100	62/– Doz.	8	1303	7/– ,,	14 (a)	5000	26/8 ,,	6	5118	35/8 ,,	7
0101	63/8 ,,	8	1330	90/4 ,,	14 (a)	5001	39/4 ,,	6	5119	48/4 ,,	7
0102	76/– ,,	8	1340	99/8 ,,	14 (a)	5002	26/8 ,,	6	5120	35/8 ,,	7
0105	90/4 ,,	9	1380	42/– ,,	14 (a)	5003	39/4 ,,	6	5121	48/4 ,,	7
0106	93/4 ,,	9	1381	42/– ,,	14 (a)	5006	27/4 ,,	6	5122	47/4 ,,	7
0107	107/8 ,,	9	1382	42/– ,,	14 (a)	5007	40/– ,,	6	5123	65/8 ,,	7
0110	109/– ,,	8	1390	46/– ,,	14 (a)	5008	27/4 ,,	6	5124	12/– ,,	7
0111	112/– ,,	8	1391	46/– ,,	14 (a)	5009	40/– ,,	6	5125	16/4 ,,	7
0112	129/– ,,	8	1392	46/– ,,	14 (a)	5010	32/8 ,,	6	5500	10/4 Each	10
0115	135/4 ,,	9	1700	19/– ,,	15	5011	45/4 ,,	6	5501	12/4 ,,	11
0116	140/– ,,	9	4005	9/4 Each		5012	32/8 ,,	6	5502	9/8 ,,	10
0117	158/8 ,,	9	4006	10/8 ,,		5013	45/4 ,,	6	5503	11/8 ,,	11
0121	29/4 ,,	12	4007	10/4 ,,		5018	7/– Each	10	5506	11/8 ,,	10
0122	41/4 ,,	12	4008	11/8 ,,		5019	8/– ,,	10	5507	13/8 ,,	11
1053	2/– Each	11	4009	11/4 ,,		5024	17/– Doz.	12	5508	11/– ,,	10
1054	2/8 ,,	11	4010	12/8 ,,		5025	25/4 ,,	12	5509	13/– ,,	11
1056	3/8 ,,	11	4011	12/4 ,,		5026	24/– ,,	12	7006	15/8 ,,	11
1057	2/– ,,	11	4012	13/8 ,,	Separate	5027	28/– ,,	12	7007	17/8 ,,	11
1058	2/4 ,,	11	4015	12/8 ,,	Leaflet	5028	19/– ,,	12	7016	16/4 ,,	11
1059	3/– ,,	11	4016	14/– ,,		5029	28/– ,,	12	7017	18/4 ,,	11
1060	1/4 Pair	11	4017	14/– ,,		5042	8/8 Each	11	7031	14/– ,,	10
1061	1/8 ,,	11	4018	15/4 ,,		5043	9/8 ,,	11	7032	15/4 ,,	10
1062	2/– ,,	11	4019	15/4 ,,		5044	28/4 Doz.	7	8000	71/– Doz.	13
1076	2/8 Each		4020	17/4 ,,		5045	41/– ,,	7	8001	85/– ,,	13
1077	3/8 ,,		4021	16/8 ,,		5046	32/4 ,,	7	8006	71/8 ,,	13
1079	2/4 ,,	Separate	4022	18/8 ,,		5047	45/– ,,	7	8007	85/8 ,,	13
1080	3/– ,,	Leaflet	4090	30/– Doz.	12	5114	19/– ,,	7	8010	77/– ,,	13
1105	4d. ,,		4091	35/– ,,	12	5115	27/– ,,	7	8011	91/– ,,	13
1115	4d. ,,										

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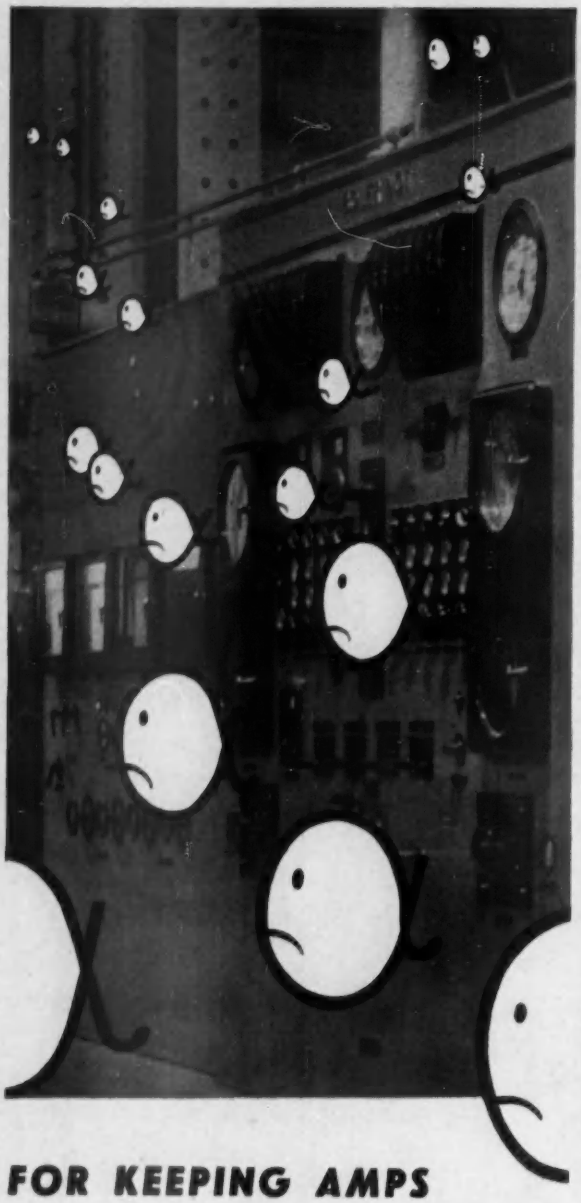

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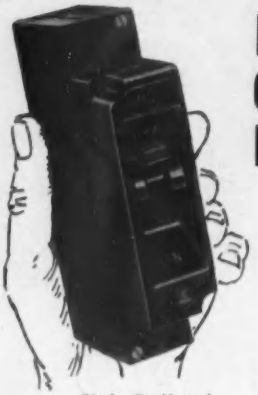

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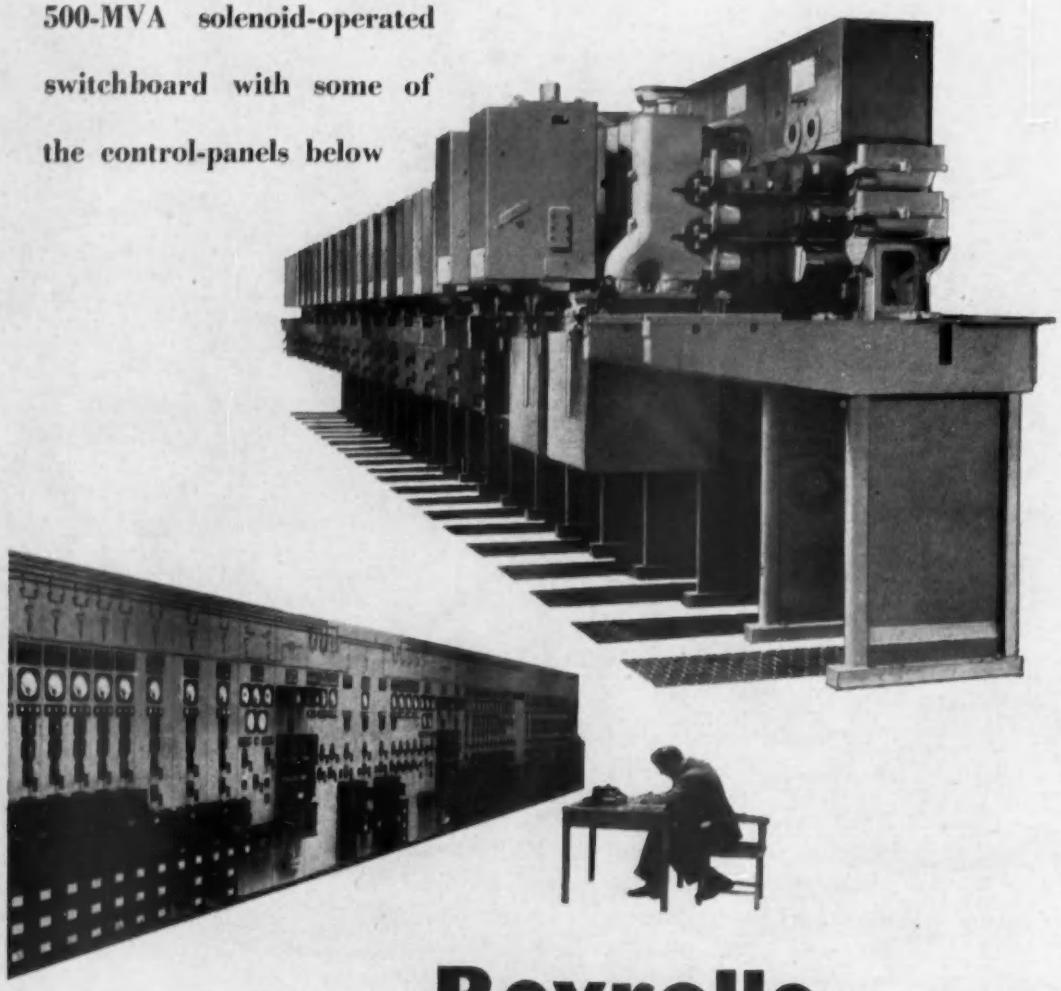
Part of a 63-panel 11-kV 500-MVA solenoid-operated switchboard with some of the control-panels below



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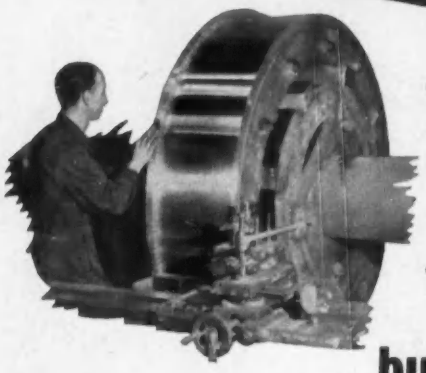
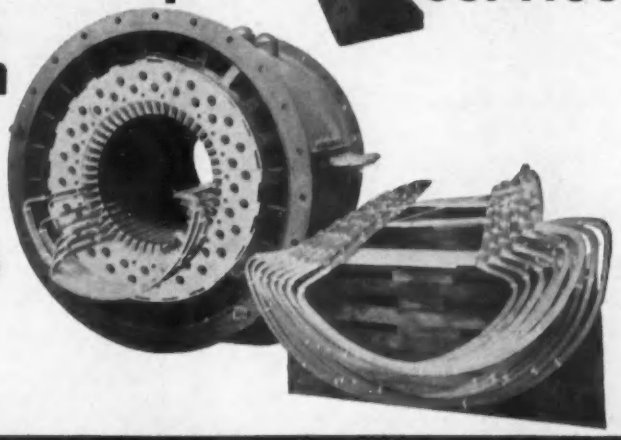


we haven't left room to say much but if you need electrical repair services

get in touch with the nearest of these addresses



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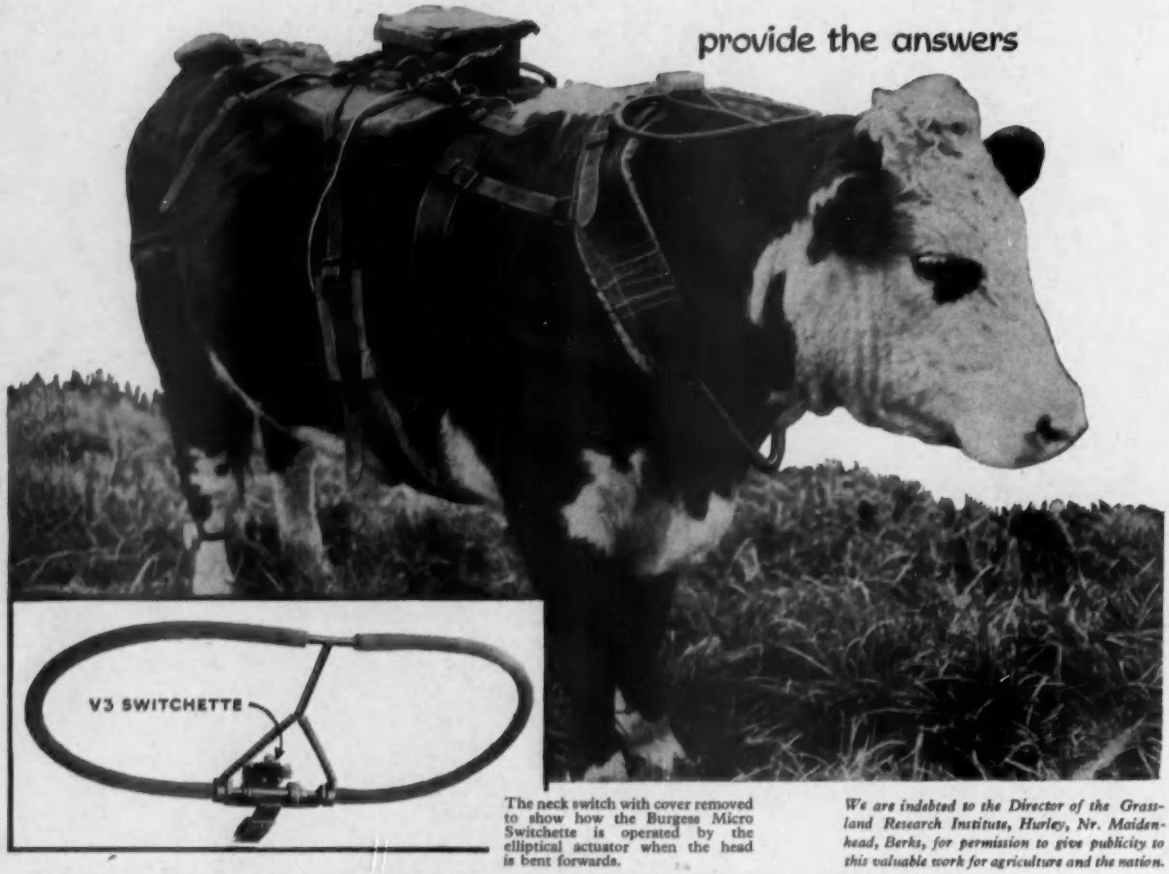

The neck switch with cover removed to show how the Burgess Micro Switchette is operated by the elliptical actuator when the head is bent forwards.

We are indebted to the Director of the Grassland Research Institute, Hurley, Nr. Maidenhead, Berks, for permission to give publicity to this valuable work for agriculture and the nation.

BURGESS MICRO SWITCHES AID GRASSLAND RESEARCH

To obtain data on bovine reaction to various types of grazing, the Grassland Research Institute at Hurley have designed and produced ingenious automatic recording equipment which is harnessed to grazing bullocks in the manner illustrated above. Certain tell-tale movements of the animals are carefully recorded to provide precise data with which to build up complete diaries of the day to day happenings in their lives.*

Burgess Micro Switchettes play important roles in this scientific investigation, three being employed in each harness. One Micro Switchette is operated by cam action from the elliptical actuator resting on the bullock's neck, the switch operating when the head is bent downwards during grazing. Two more Micro Switchettes are built into small pressure-plate switches situated in the lower portion of the belly band and operate when the animal lies down. All three Micro Switchettes are wired to recording gear carried on the bullock's back.

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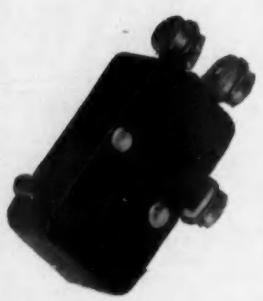

**Canaway, R. J., Raymond, W. F., and Tayler, J. C. The automatic recording of animal behaviour in the field. Electronic Engineering 27 (March 1955).*

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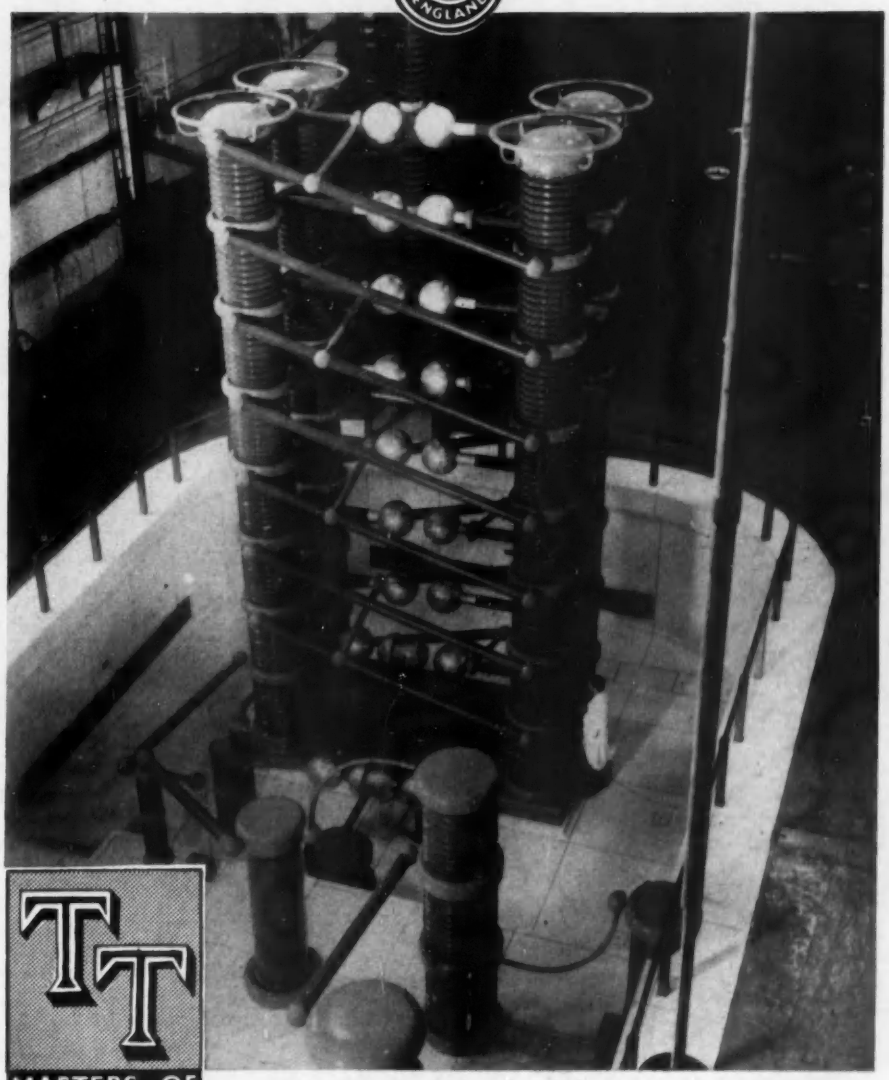

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ALUMINIUM CENTENARY EXHIBITION

A hundred years of progress

The comprehensive exhibition being staged by the Aluminium Development Association at the Royal Festival Hall, June 1–10, traces the remarkable development of aluminium over the past 100 years and illustrates its many and varied uses in the world of today and tomorrow. I.C.I. 'Kynal' aluminium alloy sheets and extrusions have played their part in numerous exhibits—in the construction, for example, of the London Transport Executive coach and the British Railways diesel coach to be seen in the railway section.

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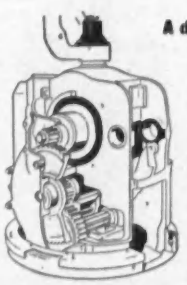

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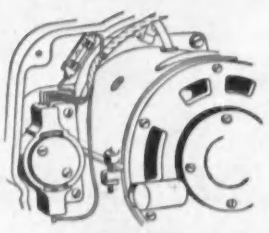

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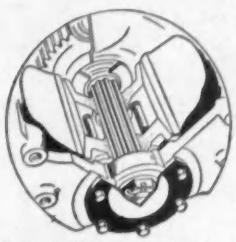

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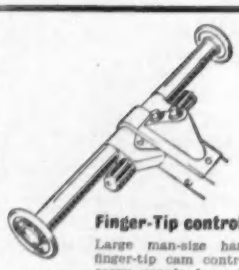

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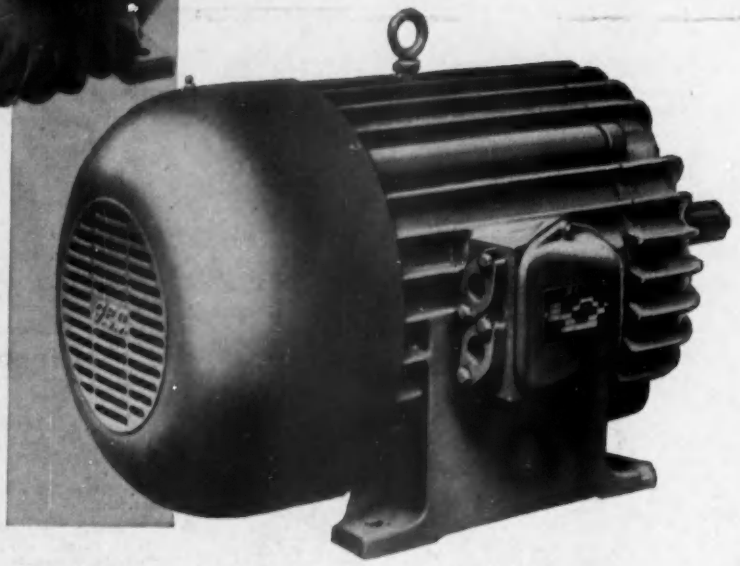

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C

NUCLEAR LIMITATION

The last few days have seen two notable additions to the trickle of information available on the British nuclear programme. A brilliant lecture in which Sir John Cockcroft captured the imagination at a meeting of the Institution of Civil Engineers has been joined by an official description of developments afoot at the Harwell research establishment. In the broad review which both accounts provide, one crucial fact shows up in relief: it is the ingenuity of metallurgists which will largely determine the rate at which nuclear reactor design can progress. Nuclear physicists, engineers and chemists still have many problems to solve, but it is metallurgy which is proving the limiting factor at present. This is no new discovery; notably, it was implicit in Sir Christopher Hinton's review of reactor programmes and prospects, delivered to the Institution of Mechanical Engineers just over a year ago. Now, however, the judgment is clarified. Problems of distortion and corrosion associated with the operation of light-metal-sheathed uranium fuel rods at high temperatures and under intensive neutron bombardment set the limit to temperature of operation of the Calder Hall type of reactor, and also to life of the uranium fuel rods themselves. These same problems are likely to be still more decisive when fast breeder reactors, developments of the experimental prototype at Dounreay, come to be built. There is an obvious parallel here with the limitations imposed on thermal efficiency in large conventional generating stations by the high temperature behaviour of steels. As in that case, progress is likely to be steady, but not rapid.

ALUMINIUM CENTENARY

Aluminium has a peculiarly direct connection with the electrical industry. Its large-scale production is an electrochemical process, and next to copper, it is the electrical metal par excellence. This week the Aluminium Development Association is staging an exhibition to mark the centenary of the introduction of aluminium into this country, and it is fully appropriate that electrical applications of the metal should have a prominent place. In 1855, according to an account published before the end of the nineteenth century, the cost of aluminium was dependent on the cost of the metallic sodium necessary to the chemical process used for its extraction, and its price was £18 per pound. By 1860, it was down to £1 per pound, and just after the first aluminium o.h. transmission line was erected in this country in 1896, it had decreased to 5s. per pound. By then, chemical

methods were completely ousted by electrical. Today, in spite of far higher costs, aluminium ingots sell at 1s. 5d. per pound, and such is the contrasting price trend of its principal competitor in the electrical field, that the long-established use of aluminium in plant and apparatus is being significantly extended today. In spite of the 100-year long attention to the metal, however, there are still some difficulties in the mechanical working that remain to be overcome, as the development of aluminium-sheathed cables shows. Thus the future is not without prospects of new advances in application to add to the great range of the past, and these should be forecast at the discussions which are to be a feature of the present exhibition, and which we plan to deal with in our next issue.

DISTRICT HALF-CENTURY

Another jubilee which falls this year is the fiftieth anniversary of the electrification of London's District Railway, the shallow sub-surface route joining the West and East of the metropolis. From its opening in 1868 until the early years of the twentieth century, the District Railway was operated by steam engines and passengers were subjected to a most unpleasant ordeal by smoke. Then, increasing competition from road transport, which was becoming mechanised, and from the electric underground railways forced electrification to be considered as a means of keeping up revenue. Experimental installations were operated in 1900, but it was not until the middle of 1905 that an electrified service right across London was introduced. In the meantime there had been fought one of the classic controversies of the earlier days of electricity—the third and fourth rail d.c. system against an overhead conductor system using alternating current at high voltage. The d.c. rail system won, and is still in use as the District Railway starts on another 50 years of electrified operation.

LIGHTING MADE EASY

Many changes in presentation, but few in technical requirements, are apparent in the newly published revision of the Illuminating Engineering Society's Code for Lighting in Buildings. This Code has for long been established as the standard for this country, and it has attained additional reputation as the internationally recommended model for new codes elsewhere. But although the previous editions contained all the information necessary for establishing lighting standards, they had the drawback that they were designed for use by professional illuminating engineers and thus confined to essential information. Most often, however, small installations are designed without the benefit of the supervision by such men, architects and plant engineers having the responsibility of deciding the layout of the lighting fittings used. The latest edition of the Code should be more helpful to such users than its bare-boned predecessors. Normally, the cluttering up of a standard code with background information of textbook type would be unwelcome, but on balance, the present instance is an acceptable exception. If it has the result of improving lighting standards by its wider intelligibility, the new Code will have done a good job. It may indeed prepare the way for yet another edition some years hence, in which standards can be increased to the higher levels some engineers are even now predicting.

MOBILE RECTIFIERS FOR TRACTION

Reduction of capital cost, particularly of fixed equipment, is a problem which has long bedevilled railway electrification, and for many years h.v. alternating current at normal frequency has appealed to engineers because of its lighter overhead equipment and widely spaced substations. The intensive French attack over the past few years on the basic difficulty of locomotive design is now yielding remarkable results. The performance recently put up by the experimental locomotive using ignitron rectifiers, which with an overall weight of only 70 tons was capable of starting a train weighing 1,710 tons on a gradient of 1 in 100 must approach a performance record. The increasing practicability of high voltage a.c. using rectifiers on the train is also shown by data now available from America on the use of both locomotives and multiple unit rolling stock. This equipment operates on 11 kV 25 c/s as against the French 25 kV 50 c/s system. In this country experiments are continuing on the Lancaster-Morecambe-Heysham line at the less spectacular level of 6·6 kV 50 c/s. With this technical activity, the future is undeniably bright for h.v. a.c. traction systems; and in addition there are the potentialities of the germanium power rectifier with its high efficiency and small size to offer even greater promise in this field.

A THIN EXCUSE

Our friends in the gas industry have a remarkable record for aggressive confidence in their product, but the continuing fall in domestic consumption seems to be at last disturbing their equanimity. This is the only reasonable explanation for statements at last week's annual meeting of the Institution of Gas Engineers, which lamely put forward slimming with the consequent retreat from the traditional breakfast, as a significant factor in the decline of gas sales to the home. We imagine that diet-sheet-ordained breakfasts of orange juice (out of the refrigerator?) and toast (prepared at the table) may add fractionally to the electricity demand, but will have little effect on gas consumption. Certainly, there must be more likely reasons for the fall of 3·2% in the domestic use of gas apparent over four years. Nor do some of the other reasons advanced last week fill the bill completely, though they may be nearer the mark in some ways. Less use of gas boilers may indeed be a fact, but this is largely due to the arrival of the electric washing machine in home and launderette. Similarly, although it is true that under the stimulus of competition from electric designs, the efficiency of the gas cooker has been increased, this cannot have brought with it a fall in consumption as serious as the figures reveal. The probable explanation for the falling away in the home use of gas is less complicated. Preference for the many advantages of electricity is taking increased effect.

Meteor

Power Development on the Sutlej River

Combined Power and Irrigation Scheme for Indian Punjab

By T. V. SREENIVASAN, B.E., M.Sc. Tech. (Man)., A.M.I.E.

COMBINED irrigation and power projects are vital in the rapidly developing areas of Asia, India and the Near East. One of these is the Bhakra-Nangal project which utilises the waters of the river Sutlej in the Indian Punjab, and which is expected to provide irrigation for about four million acres of land, and to have an ultimate firm power output of about 300 MW. The first stage of this scheme, the Nangal project, went into operation on 2nd January of this year, even before the completion of the Bhakra dam, and generating plant is now being installed to bring this part of the project up to its firm output of some 96 MW.

The two stations are located on the Nangal canal, one located some 12 miles from the dam and the other at 18·6 miles. The canal itself has a flow capacity of about 12,500 cusecs with a depth of 20·6 ft and for the two power stations under consideration, the available head will be in total between 245 and 255 ft, giving a head of approximately 100 ft at each of the stations.

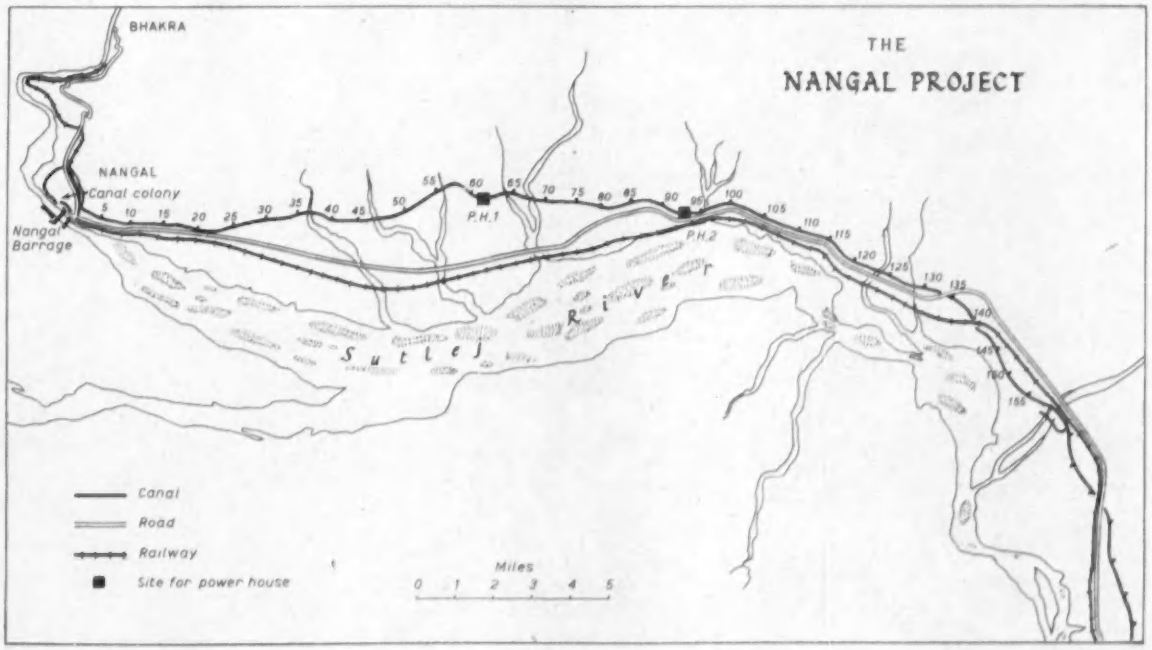
During the pre-Bhakra stage, the project has to depend only on the free flow of the Sutlej river of which records are available for the last 39 years. The minimum flow, registered over this period (with the exception of two years) is 3,000 cusecs, and on this basis, the power stations can give a firm power of 43,500 kW and a peak power of 69,100 kW, based on a weekly load factor of 63%. Hour-to-hour detailed studies have shown that maximum storage area above Nangal No. 1 is 900 acre-feet and above Nangal No. 2, 361 acre-feet. After the Bhakra scheme has begun operating, and the two power houses each with three 27·5 MVA sets are running at full load, the minimum canal flow will be 7,500 cusecs with a storage capacity of 20,075 acre-feet above Nangal No. 1 and no storage between No. 1 and No. 2. The Nangal canal carries on from Nangal No. 2 power station to Rupar, where it will feed the Sirhind and other canals for irrigation purposes.

Nangal No. 1 Station

Water enters the No. 1 station through three 19 ft 3 in. dia penstock pipes to three vertical shaft single runner Kaplan turbines. These pipes are of riveted construction, both circumferentially (three sections) and longitudinally, and are completely embedded in concrete. The thickness of the liner is $\frac{3}{8}$ in. except for a short distance near the turbine inlet where it has been increased to 0·6875 in. The available head varies from 90 to 105 ft, the mean value being 98 ft. Manufacture of the draft tubes and of the turbine scroll cases was carried out at Amritzar workshops to the turbine makers' specification. Maximum pressure rise in the penstock in emergency is about 30% of normal.

Each turbine is provided with individual oil pressure systems for each governor, with two motor driven pumps, one suitable for 400 V a.c. and the other for 220 V d.c. Over-speed and low-speed protection is provided together with brakes, which, when the machine is stationary can also be used to jack up the shaft. The estimated flywheel effect of the turbine set is $10{\cdot}5 \times 10^6$ lb/ft^2 and the maximum runaway speed 270%. The normal running speed of the turbines is 166·7 r.p.m.

The general view of the Nangal project is shown in this map which gives the relative positions of the Nangal-Hydel Canal, the road, the Sutlej river and the railway. The main fall in the river is in the region of the Nangel-Bhakra section



Pandit Nehru views the works on the Nangal Hydel Canal in this photograph taken during the early constructional stages

The alternators are, of course, direct-coupled and are rated at 27·5 MVA, 11 kV, 3-ph, 50 c/s at 0·88 p.f. The per-unit synchronous reactance is 0·595 and the short circuit ratio 1·8. The machines have water-cooled air circuits and the exitation is through totally enclosed main and pilot exciters. Six embedded thermocouples give indication of stator temperatures. The neutral of each generator is earthed through a resistance capable of carrying the maximum fault current for 30 sec. For governing purposes a permanent magnet alternator is used, mounted on top of the generator shaft and this provides three-phase power to a synchronous motor.

Electrically, the unit system is used, the generator, step-up transformer and station transformer are all directly connected thus avoiding 11 kV busbars and switchgear. Paralleling is carried out at 132 kV through outdoor switchgear on the h.v. side of the generator transformers. The auxiliary transformers are 400 kV, 11/0·4 kV and are connected to a 400 V distribution board.

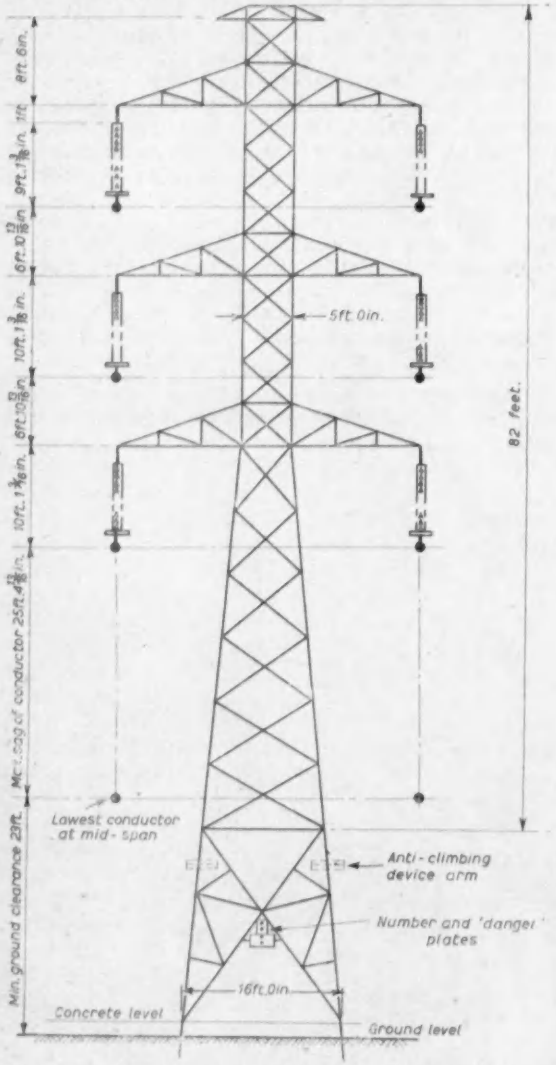
Each main transformer (27·5 MVA, 11/132 kV, delta/star with a per-unit impedance of 0·7) is provided with off-load tap-changing equipment and is of the forced oil circulated water-cooled, shell type. When, as is ultimately envisaged, the line voltage is raised to 220 kV, it is proposed to install auto-transformers with a ratio of 133/220 kV and parallel with the 220 kV lines from Bhakra. All transformers in this project are fitted with conservators and silica-gel breathers, and where the neutral is available it is solidly earthed. In those cases where the transformer neutral is not available, an earthing transformer has been included.

Station Protection

Extensive protection has been provided. Each unit, comprising generator, step-up transformer and auxiliary transformer, has instantaneous balanced differential for phase and earth faults, back-up inverse time-lag over-current for the main transformer, field earth-fault alarm, negative-phase sequence protection (where recommended by the generator manufacturer), over-voltage, double-float Buchholz and oil temperature alarm for the main transformer, inverse time-lag over-current on the h.v. side of the auxiliary transformer, over-current and instantaneous balanced earth fault on the l.v. side of the same transformer and stand-by earth fault protection for the neutral earthing resistance.

Distribution

The main transmission system will have voltages of 220, 132, 66, 33 and 11 kV. Of the greatest importance is the extremely long 220 kV double-circuit line connecting the Nagal project to Delhi; this line will be about 200 miles long, and will initially operate at 132 kV. In addition there will be 68 miles of 132 kV double-circuit lines, and 382 miles of 132 kV single-circuit branch lines. The 66 kV network is fed only at Ambala and Panipat but will be reinforced by 23 miles of double-circuit and 153 miles of 66 kV single-circuit lines. At 33 kV, 797 miles of single-circuit line is to be erected. The scheme involves more than 40 grid substations transforming from 220 to 132 kV, 132 to 66 kV or 66 to 33 kV, and 184 distribution substations fed at 11 kV and supplying power at 400/230 V to 184



Electrical dimensioning of a typical steel tower for the 220 kV transmission line from Nangal to Delhi

towns in the Punjab. This extensive network will be fed from both the Nangal stations together with the two Bhakra stations to be built on the Bhakra reservoir above the take off from the Sutlej River of the Nangal Hydel Canal. It will also be interconnected via Ludhiana with the Uhl River hydro system.

The Nangal project, consisting of the two initial power stations, will distribute its power according to the following allocated loadings. Delhi, 20 MW, United Provinces, 10 MW, Bilaspur 1 MW, Punjab (1) 43 MW; Pepsu 15 MW, and Rajasthan 11 MW.

Tower Design

Steel towers are to be used for the 220 kV, 132 kV and 66 kV lines, the normal span for all being 1,000 ft, with a.c.s.r. conductors, of Al. 30/·146, steel 7/·146 for the 220 kV system. Poles or rails will be used for 33 and 11 kV lines with copper conductors; and for 33 kV lines with large size a.c.s.r. conductors, H-poles or lattice towers will be utilised. The normal span of these lines will be 400 ft. Four types of deviation tower for each voltage have been standardised: a tower capable of taking deviations up to 1°, and others for 10°, 45° angle and dead-end. These have all been designed on the usual specification for wind load and broken wire, and provision has been made for the fitting of extension pieces to the stubs of the towers to give extra heights of 10 and 20 ft. The towers are earthed by means of a gas pipe 1 in. dia driven 8 ft below foundation level.

Double-circuit lines are provided with two earth wires and single-circuit lines with one. These lines of galvanised steel strand are suspended from clamps attached to the towers. The conductors are armoured at the points of support for preventing abrasion and decreasing the bending stresses due to vibration.

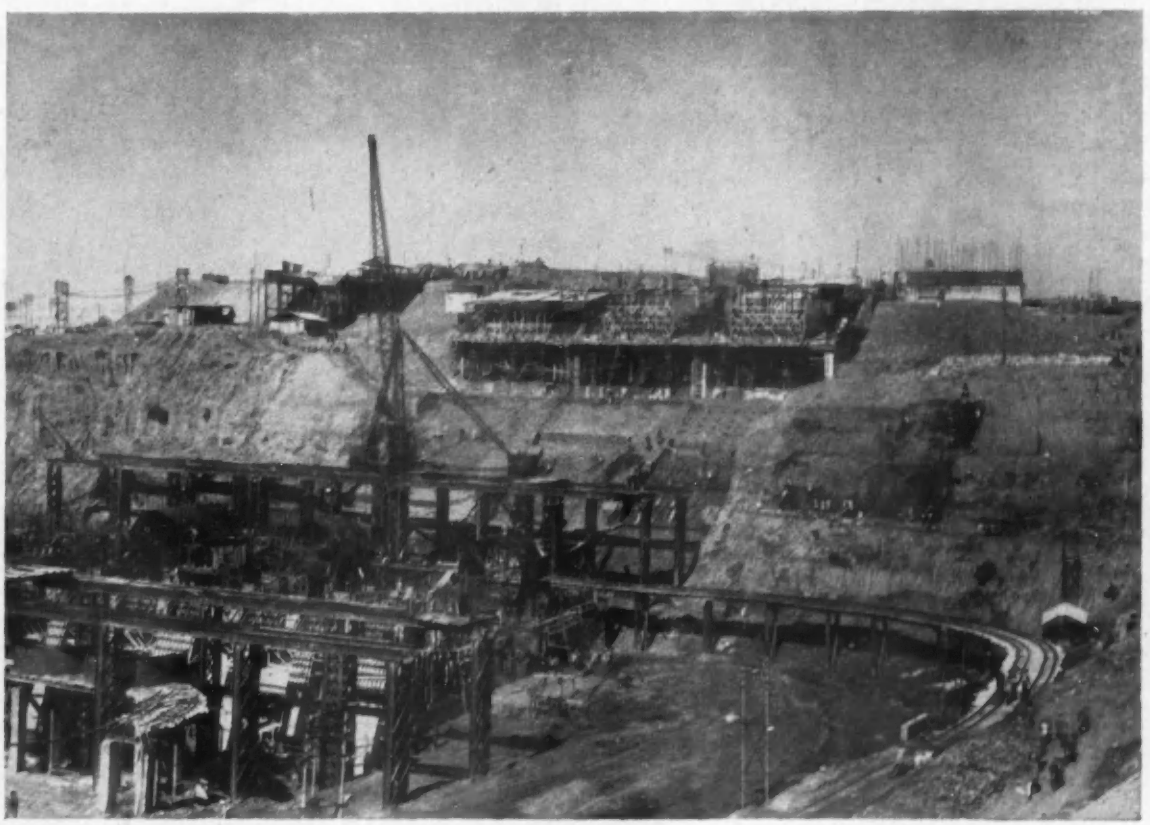
Normally 15 insulator units are used for the 22 kV lines with a grading ring supported at the live end, and 9 units for the 132 kV lines with an arcing horn at the live end.

Switchgear

Sectionalised ring busbar systems have been extensively adopted. With the exception of the substations at Jullundur and Ludhiana, where 132 kV and 33 kV air blast circuit-breakers are used, oil circuit-breakers are universal. Breaking capacities have been laid down as 132 kV, 3,500 MVA, (o.c.b.) 250 MVA, 11 kV (o.c.b.) 150, 75 and 15 MVA. For the air blast breakers the ratings are 132 kV, 2,500 MVA and 33 kV, 480 MVA. It is also specified that the breaking time of the 132 kV circuit-breakers shall not exceed 5 cycles, and of the 60 kV and 33 kV breakers, 8 cycles. Some of the smaller 33 kV substations are not provided with circuit-breakers on the h.t. side and here switch-fuses are used.

Protection on the 132 kV line is carrier current with back-up over-current, excepting the two 132 kV interconnectors between Nangal Nos. 1 and 2 power stations, which will be provided with balanced pilot wire feeder protection for phase and earth faults, and also back-up over-current protection. On the 66 kV lines, distance protection will be provided and on the 33 kV and 11 kV lines, inverse time lag over-current with definite minimum time setting and earth fault will be installed. Autovalve lightning arrestors are to be used at Nangal, Ambala, Panipat and at other situa-

Early work on Nangal No. 1 power station to show the three penstock foundations and the power house foundation work



tions, although a certain number of "Thyrite" arrestors will also be included to give protection to these lines.

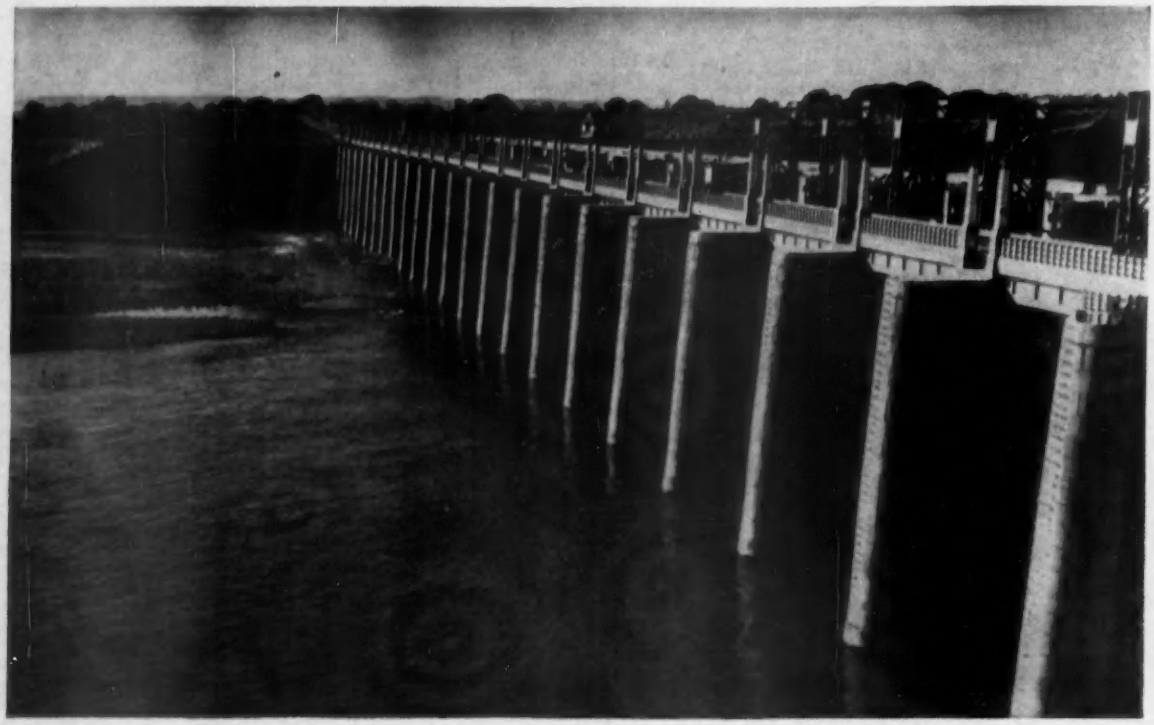
Stability

As has already been mentioned, the Bhakra-Nangal system will be interconnected with the existing Uhl river hydro-electric project which has been partially operating for some time. The question of stability of such an interconnected network is consequently of great importance, and analysis of the behaviour of these interconnected power systems under various loading conditions was carried out on the General Electric network analyser at the Indian Institute of Science, Bangalore. Based on these studies it was concluded that initially at least, the voltage at Nangal should be raised to 103·3% under full load conditions, and that at Muktsar, Ambala and Abdullapur, leading p.f. condenser capacity should be installed to the values of 4·3, 11·3 and 4·3 MVAr respectively. Over the long line to Delhi, some 5·55 MVAr of condenser capacity will be needed, if all transformer taps are set to zero.

The Main Scheme

In the above, attention has mainly been confined to the Nangal section of the Bhakra-Nangal project. The completed scheme is designed to give 621 MW of firm power, with 153 MW of secondary power for a total installed capacity of 1,044 MW. Of this, 144 MW is contained in Nangal No. 1 and 2 power stations, 540 MW in Bhakra dam (left bank) and 360 MW in Bhakra dam (right bank). There is in addition a further site available at Rupar on the Nangal canal which is capable of producing about 20 MW but in view of the size of the four power stations mentioned, the development of this site practically, is not yet contemplated.

Above is the offtake point of the Nangal Hydel Canal, and below one of the dams across the Sutlej River. These works are both for power generation and irrigation purposes



Research for Nuclear Power

Harwell's Part in the Reactor Programme

RESEARCH and development work on which Britain's expanding nuclear power programme is based is still concentrated at the Atomic Energy Research Establishment at Harwell. The range of this activity is sketched in some detail in a book published last week,* which continues up to August, 1954, the story begun in the Stationery Office publication "Harwell—the British Atomic Energy Research Establishment 1946-1951." August, 1954, was the date of formation of the Atomic Energy Authority.

Harwell's primary role is now to carry out long-term research, and to act as a source of ideas for reactors and processes. Main responsibility for applied research has rested with the Industrial Group of the Ministry of Supply's Atomic Energy Section, but Harwell is still active in the development field. Particularly is this so in relation to the development of reactors for power stations.

Reactor Design

Three main considerations apply in the design of a nuclear reactor. First, it is necessary to make sure that the neutron balance will permit the establishment of a fission chain reaction; second, the heat so generated must be removed usefully; third, there must be care that the fission reaction continues throughout the life of the pile.

Physicists are concerned with the first of these stages. They follow through the life history of the neutrons in the proposed design, and produce a balance sheet showing the excess of neutrons available for dealing with contingencies. Calculations are made leading to an optimum design with perhaps ½% uncertainty in neutron surplus. Small sections of the design may be built, too small in themselves to maintain a chain reaction (sub-critical), an external source of neutrons applied, and measurements made. Alternatively, a full-scale assembly developing only a few watts of heat may be built (zero energy). Such assemblies do not require much shielding or cooling.

The second consideration, removal of heat generated, is primarily an engineering problem. A heat-transfer substance that will be efficient and yet not interfere with neutron balance has to be found, and this has to be suitable from corrosion and radiation damage viewpoints. Finally, keeping the reactor going is largely concerned with the stability of fuel rods or elements under irradiation and heat stress, and with the removal of by-products which would otherwise destroy the neutron balance. These factors involve the metallurgist, the chemist, and the chemical engineer.

In carrying through this work for the Calder Hall reactor, Harwell has been involved in much research work. In particular, the uranium-graphite lattice it is proposed to use is being investigated in a sub-critical experiment.

A reactor will probably use its uranium fuel in the form of rods, enclosed in a metal can. The intense heat flux in the reactors and the neutron flux combine to set up stresses in the rods tending to distort them, or even to cause them to disintegrate. "If fuel rods are to have a reasonably long life in any reactor it is necessary to find metallurgical treatment which will minimise the effects of neutron damage and thermal stress. This necessity is the driving force behind much of the metallurgical work at Harwell." So comments the author of the present publication.

Development work along these lines in the metallurgical division has led to the study of types of fuels other than pure metals, for example, metal alloys, ceramics or cermets (mixtures of metals and ceramics) and slurries. In this work the main emphasis has been on powder metallurgy, which is well suited to the production of special structures not readily made by other means.

Fuel Processing

All the time a reactor is operating, active fuel is being "burnt up" and by-products are being formed which reduce the activity of the reactor. Eventually, a time comes when the spent fuel has to be replaced. It is then necessary to reprocess it, for it will invariably contain some "unburnt" fissile atoms as well as fission products. Two approaches are possible. Either those fission products which inhibit the nuclear reaction (the pile poisons) may be removed, and the metallic uranium (now containing some plutonium) used again; or the plutonium produced in the reactor separated from the uranium in which it is formed, and put to other uses. The methods being developed for the first alternative include melting the fuels and skimming impurities from the melt, electrolysing the fuels at high temperature in fused salts, and dissolving the wanted metal in other molten metals, also at high temperatures. Separation of plutonium from irradiated uranium, the second alternative, is an established process using a solvent extraction method.

New Reactors

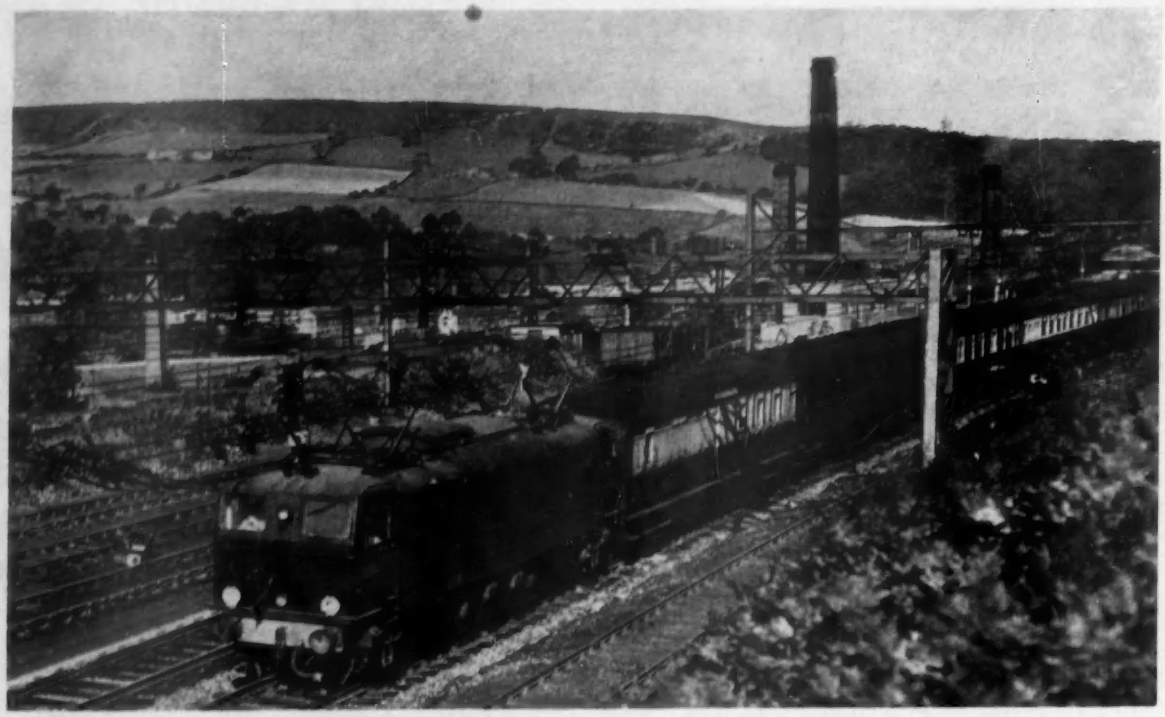
To carry on work in all these fields, Harwell obviously needs reactors itself. Some of those it possesses have been extensively described before, but two receive special attention in this book. They are the new heavy water reactor, using enriched uranium fuel, and known as E443, and the zero-energy fast reactor, Zephyr, fuelled with plutonium rods in metal cans.

E443 will have a total heat output of about 10 MW, and a neutron flux about 50 times that of the BEPO pile. It will reduce the time required for much experimental work on the effects of neutron irradiation. Heavy water is used for cooling as well as for moderating the reactor. Flat strips of cadmium-plated steel control the reactor. The complete reactor is built in a cylindrical steel building 70 ft diameter and 70 ft high for safety reasons.

Zephyr has a lattice of canned plutonium rods arranged with some of uranium for breeding purposes in a reacting core about the size of a top hat. This core is surrounded by a blanket of uranium which returns to the core neutrons that would otherwise escape and captures some neutrons to form plutonium. Control is not by neutron-absorbing rods as in other types, but by removing part of the blanket. In emergency, a large block of uranium forming the bottom of the reflector can be blown out quickly.

These, then, are a few of Harwell's interesting activities. The new book reviews in a readily understood form many more, and is excellent value.

*Atomic Energy Research at Harwell, by K. E. B. Jay, Published by Butterworth's Scientific Publications, price 5s.



Electrification—

and the Railway Modernisation Plan

By S. B. WARDER, M.I.Mech., M.I.E.E., Chief Electrical Engineer, British Railways

NO part of the recently announced plans for the modernisation of the railways have attracted more favourable reception than the proposals for a large measure of electrification. Whether it is on the score of cleaner, more punctual and faster trains or more effective use of our own home produced coal, there is acceptance of a programme which has been for so long regarded in some quarters as greatly overdue.

It is comparatively recently that articles were being written deploring the slow rate at which electrification was being introduced into this country. This has, however, not been due to any lack of zeal on the part of the electrical engineer nor that the benefits of electrification were not fully appreciated by those in authority.

However, no useful purpose can be served now in reflecting over the past twenty years, which have seen this country through several economic crises, and a devastating war, to say nothing of power cuts. It is more pertinent to address ourselves to the immediate question of the part the electrical engineer is to play in the re-equipment of British Railways on up-to-date and modern lines.

Recent Progress

To dispose first of the matter of how much has, in fact, been done in the electric traction field since British Railways were nationalised in 1948, the record shows the following completed schemes: Liverpool St-Shenfield (completed in 1949, and compising 24 route miles, and 92 three-car multiple unit sets); Manchester-Sheffield-Wath (completed in 1953 and comprising 68 route miles, 65 locomotives and 8 three-car multiple unit sets), and the Lancaster-Morecambe-Heysham 6·6 kV 50 c/s single-phase experimental electrification scheme.

Work currently being undertaken includes the re-equipment of the complete Southern Region suburban power distribution networks including 71 rectifier substations (to be completed in 1957) and 1,711 Southern Region suburban multiple unit cars, built or programmed up to 1956. Five main-line diesel-electric locomotives have also been ordered. In hand, are schemes for the re-equipment of the Tyneside, the Mersey and the Euston/Watford electric services, together with orders placed for 432 diesel-electric shunting locomotives of 350 h.p. each.

The programme or work listed above represents a capital investment of about £57m, the greater part of which will have been carried out since 1948. Surely not an inconsiderable sum for an undertaking which has been accused of "dragging its feet" on electrification.

It may also be argued that the application of the diesel engine to rail traction is not the province of the electrical engineer, but this is far from the case. It is, in fact, the electrical engineer who has made it possible for the diesel engine to be used, by an electric transmission whereby the engine drives an electric generator which provides the necessary energy for traction motors geared to the driving wheels.

The 9.30 a.m. train from Liverpool Central to Hull passing Deepcar. The locomotive shown working on this section of the Manchester-Sheffield electrified line is No. 26053

In spite of all his efforts, the mechanical engineer has yet to establish a proved design of mechanical drive which is equivalent throughout the speed range to an electric drive for locomotives of 350 h.p. and over on a like-for-like basis.

With the gradual passing of the steam locomotive the electrical engineer must occupy an ever increasing importance in the railway field as the engineering problems are becoming more and more fundamentally electrical.

The performance of electric tractors depends on the characteristics of the electrical equipment, particularly the traction motors, which decide ultimately the number and diameter of the driving wheels. The electrical engineer has the initiative and direction, with the co-operation of the mechanical engineer, in matters of structural strength and other features concerning the safety of the vehicle on the road. Likewise, the maintenance of the electric vehicles in service is under the control of the electrical engineer because their success or otherwise as motive power units depends predominantly on the proper working of the electrical equipment.

Modernisation Plan

The modernisation plan provides for large measures of electrification and dieselisation, the degree of each being determined mainly by what it is thought can be achieved with available resources over a period of 15 years.

The heavy operating cost of steam traction in relation to the availability of engine power obtained, together with a diminishing supply of large coal have been the chief reasons leading to a change in motive power, and the studies which have been made of the problem have shown that the requirements of British Railways can be best met by a combination of two forms of motive power, namely, electric for heavily trafficked main lines and densely populated suburban and urban areas, with diesel traction for shunting and branch line services.

The plan proposes to institute this policy over selected routes as soon as possible, and the effect will be gradually to eliminate steam traction by progressively encircling the steam services remaining between these two fields, due regard being paid to the economics of the case.

With the acceptance of the plan it is to be expected that questions will be asked as to when some results are likely to be seen of its execution. These are early days yet and much detail work has to be done inside the railway organisation itself, and discussions have to take place with the various industrial organisations, without whose help the plan cannot succeed.

As far as motive power is concerned, it is a fact that the diesel programme is already well advanced in the smaller powers. Shunting locomotives are already being delivered at the rate of well over 100 a year and substantial numbers of diesel rail vehicles are scheduled to come into service in the next few years.

It is expected that an effective order for main line diesel-electric locomotives will be placed soon from which the future standard British Railway types will finally emerge as experience of available British designs of power equipment is obtained. The plan, it will be recalled, is to be well under way in five years and be completed in fifteen.

Electrification, because of the fixed equipment required, involves other departments, notably the civil engineering and signalling departments; consequently, the initial planning is rather more complex. There are, however, sufficient plans well enough advanced to ensure an early start on some of the schemes proposed.

The pattern may be somewhat as follows: on the Eastern Region all the main contracts have been let for the extension of electric working from Shenfield to Chelmsford and Southend (Victoria) and this scheme should be working by the end of 1956. It should thus be comparatively easy for the further extensions contemplated in the Liverpool Street area to continue with the work now in hand by the same organisation, but at a faster rate than hitherto.

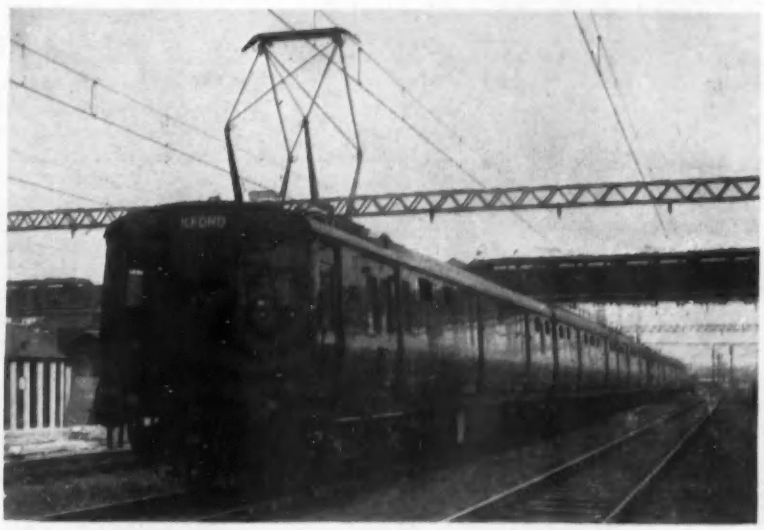
Likewise, with the end in sight of the frequency conversion scheme of the Southern Region suburban electrification system, it will be possible for plans, long since prepared, to extend the electrification to Dover, Ramsgate and Hastings, to proceed within a fairly short time.

A scheme of suburban electrification in the Glasgow area is ready and only awaiting a measure of co-operation from the Glasgow Corporation. This can be started as soon as the necessary agreement is reached, and while not so financially attractive at present levels of traffic, I personally have no doubt that with the improved amenities Clydesiders would follow the example set by the South London travelling public after the electrification of the Southern Railway.

Main Line Schemes

It is the main line schemes which are the most important and attractive part of the plan and likely to excite the greatest interest. The main line from Euston to Birmingham, Manchester and Liverpool forms a system which is probably the most densely occupied part of the British Railway network. If electrification cannot justify itself here, then there is little hope elsewhere. It is not only passenger traffic, but the more important freight working which is so intensive, and with the introduction of fitted continuous brakes on all goods wagons the full benefits of electric working can be realised.

Suburban passenger electrified services are costly in the sense that they are largely necessary for heavy morning and evening travel peaks for which most of the rolling



An example of British Railway's up to date suburban multiple unit stock is this train on the Liverpool Street-Shenfield line

stock has to be provided. This demands a correspondingly heavy peak load on the electricity supply already under pressure from the national peak. With the main line traffic on the lines to the North, the impact will be different, with heavy freight and sleeper trains running throughout the night. The improvement to the national load factor should therefore be very beneficial, and likely to be attractive to the Central Electricity Authority.

As in the case of trains from Euston, so a similar justification should be obtained from the train services from Kings Cross where it is proposed to electrify as far as Leeds and York. The full benefit of this electrification will, of course, not be realised until the greater part of the area which is served by the route can be integrated into a comprehensive electrification scheme by eliminating dual working and a superfluity of motive power depots. All this will take time, and as the plan develops and experience is obtained from the new tools which are to be provided, there is every possibility that the hopes of the planners will be secured in the economies which are so essentially necessary if British Railways are to recover their former wealth and glory.

Germanium Rectifiers up to 42,000 amps

MUCH has been heard lately of germanium rectifiers in the industrial field, as well as for light current applications. In a recent issue of *Electrical Engineering* a description is given of an installation produced by General Electric of America for the Metal and Thermit Corporation. This company reclaims tin from tinplate scrap by the electrolytic method which requires a large amount of direct current at a potential of the order of 115 V. The load is constant. Recently the company decided to replace an old motor-generator set and after comparing motor generator sets, mechanical rectifiers and other metallic disc rectifiers it was considered reasonable to give the new germanium power rectifier a chance to prove the advantages claimed for it. As well as being competitive in first cost, germanium had the advantages of high efficiency, easy installation quietness in operation and little maintenance.

A group of four packaged units were supplied. Each unit consisted of six individual cells connected in the standard full-wave three-phase manner. The rating of each group was 225 amps at 65 V and as each unit could be connected in series (on the d.c. side) with a similar unit, because of isolated secondary windings on the rectifier transformer, a voltage per pair of 125 could be readily attained. Each unit is forced-cooled by a vertical motor-driven fan which pulls air over the rectifier cells and forces it over the transformer discharging it at the bottom of the unit.

Load Requirements

In common with most electrolytic processes, the initial internal resistance of the circuit is quite low. The applied voltage on starting must therefore be limited to hold down the inrush current to a reasonable value. In this case a voltage of about 25% of final full-load voltage is a safe value for use with the packaged rectifier. As the process begins, a back e.m.f. is developed which rapidly rises to near the value of the applied voltage with a consequent reduction in current to a value approaching zero. The applied voltage can then be increased in fairly large steps, until the back e.m.f. reaches a maximum value of about 80% of full-load applied voltage. Above this it is desirable to have continuous adjustment of applied voltage so that it can be set at a value which overcomes the load circuit resistance and maintains the desired load current.

Control Method

With the motor generator set it had been the practice to set the field regulator to give about 35 volts, close the main circuit-breaker and then bring up the applied voltage by excitation control. The closing of the breaker allowed a short time heavy inrush of current but this could be accepted by the machine. With the rectifiers it was necessary to limit the inrush current to protect the cells as well as to prevent operation of the instantaneous overload protection. It was already known that the power supply to the d.c. circuit should be about 100 V, 800 amps, and it was determined by experiment that an initial supply voltage of 25 V would limit the peak input current to about 200 amps. Initially, it had been decided that an induction voltage regulator would provide smooth voltage adjustment for a considerable range on either side of the 100 V mean value, but it was thought uneconomic to build such a regulator to go down to 25 V initially. As an auto-transformer starter was available, it was included in the main supply to the voltage regulator, and by opening the star winding of the auto-transformer three series reactors became available for insertion in the phase connections. These provided a most effective means of producing the initial low voltage required.

The voltage regulator itself is regulated at 475 V, 154 amps and is thus suitable for six 25 kW rectifier units. It provides continuous manual control 25% above and below nominal voltage to give a variation of from 73 to 122 V at the rectifier output terminals.

Starting Sequence

Proper sequence for starting up is ensured by interlocks on a main contactor control circuit. Fans must be running, overload trips reset and the voltage regulator at its minimum position before the main contactor can be closed. The manual short-circuiting contactor in the auto-transformer starter is always released by the "no-volt" coil when the main contactor is open.

Starting is thus simple. First the main d.c. load circuit-breaker is closed. Then power is applied to the input side of the rectifiers by push button control which closes the main contactor. This applies the minimum voltage to the rectifier giving a momentary rush of up to 200 amps depending on the back e.m.f. of the line. This quickly falls to zero, when the reactors provided by the auto-transformers are short-circuited, putting 75 V on the d.c. line when another inrush of 200 amps takes place. From this point the voltage regulator takes charge and the operator continues to increase voltage until the desired current of about 800 amps has been reached.

Under normal load conditions, with an ambient of 32°C, the greatest temperature of the rectifier cells observed is 49° C. This is well within the maximum temperature rise permissible which is 30° C over a 35° C ambient. Owing, however, to the negative temperature coefficient of the rectifier, working at higher temperatures requires progressive de-rating of the unit.

Several other units are on order, with ratings such as 16,000 amps at 65 V, 12,000 amps at 130 V and 42,000 amps at 24 V, this last unit being required for aluminium anodising work.

notes on wiring

by Megohm

WHILST looking around a very old church in the country the other day my attention was drawn to a group of rather worried looking gentlemen armed with measuring tapes, six foot rules and writing pads. Soon they all disappeared and a few searching questions to the reverend gentleman present revealed what all the trouble was about. The church heating system, which on inspection appeared very old too, was rapidly deteriorating. The pipes and radiators had suffered from the attention of the cold winter and worst of all, according to the vicar, the gentleman who had for years attended to the system had departed for ever, and nobody could be enlisted to do this very important job. Costs too were a major consideration and, of course, the fabrics of the church had to be preserved as much as possible. I gathered from my informant that many churches throughout the country were in a similar state of affairs and it is not surprising to note that the church authorities are very interested in electrical heating devices.

Heating in Churches

The Central Council for the Care of Churches prepared some time ago a booklet on the matter of Church Heating. This booklet covers various types of heating and, naturally, covers the methods of heating by electricity. Before going into the actual types of systems it is most interesting to study the principal problems of heating a church. The requirements are vastly different to those of an office block for instance. No really definite rule can be laid down to cover the requirements in all churches. Many questions arise, such as whether intermittent or continuous heat is required, does the whole church require heating, will the system selected have a damaging effect on the architectural value of the building, and many other such questions too numerous to detail.

I said that many church authorities are interested in heating by electricity, but they are also interested in the financial aspects too. Installation costs of electric heating compare favourably with those of a low-pressure hot water system but the comparative running costs, even allowing for the saving in labour charges, may be higher. Electricity is more suitable for personal comfort heating than for warming the structure. One great advantage is the flexibility of control. I do not think anyone can argue on that.

Types of Heating Appliances

Electric heating appliances suitable for churches include tubular heaters, convectors, unit heaters, radiators and block storage heaters. Tubular heaters, although ideal for installing in pews and under windows, are not really too suitable. Under normal conditions the surface temperature is approximately 160° F and, if used, care must be taken to ensure that inadvertent contact by children is impossible. They should not be fixed where they may cause shrinkage in woodwork. Convectors and unit heaters are useful in as much as they do distribute warmed air quickly and the radiators, although slow to heat up, are effective.

I personally think the answer to church heating is the block storage method of heating. These units are not unsightly and, again with careful planning, a really flexible arrangement can be obtained. Time switches can be arranged to part-heat the church at regular intervals and ensure that it is really warm and comfortable for the Sunday morning service. Of course, space is required for a control panel but this should be quite easily arranged.

One problem which may arise, particularly in very old churches, is that of down-draught from clerestory windows. Many old churches have a high section of roof which runs down the centre of the church and windows are sited there. These areas, of course, require some form of heating in order to prevent the cold air travelling down on to the heads of the congregation. Careful consideration must be given to this problem, for storage heaters cannot be mounted in such situations. Tubular heaters appear to be one solution to this problem for they can be mounted in an inconspicuous position, are not heavy and therefore do not present a danger to those sitting below.

Time Switches

Glancing through one of the many journals especially prepared for the female population, I was interested to note that the manufacturers of time switches and timing devices were displaying their wares. Illustrations showed timing devices which switched the cooker on and off, controlled the iron, and a time switch which would cut out the immersion heater at chosen times and even switch it off entirely when the family did not require hot water.

I realise that such devices have been obtainable for some time, but my interest lay in the improved designs and the attractive appearance and the mention of the ease of fitting these instruments. One illustration showed the time switch fixed to a wall near the hot water cylinder and a flexible lead serving the equipment. All very nice and attractive to the housewife but, in my opinion, extremely misleading. Such devices, even though they are said to be "easily connected" can be a source of danger and more emphasis should be placed on the matter of connecting them up.

On the other hand, these devices have been too long in making their appearance in such circles. I particularly like the time switch for the control of the water heater, and feel that many householders will take advantage of such a reasonably priced article. Many people rely on an immersion heater during the summer months and the problem of control has been a talking point for years. The question is always raised whether it is more economical to keep the water heater working all the time on the thermostat or to switch off at certain times. I do not intend to venture an opinion. With this time switch it is possible to keep the heater switched off for one whole day at a time. This should prove very useful, but I sincerely hope that these pages of the journal are overlooked in my house, for I do enjoy the luxury of hot water at any time of the day.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Saving Accountant's Time

NOW that most area boards have standard tariffs for domestic consumers, would it be possible for meter readers to fill in the demand note and leave it with the consumer at the time of meter reading? No doubt this method would involve some change in procedure, but I am sure with the use of the modern business accountancy systems now available, considerable saving in labour and materials would result.

The meter reader might have to be upgraded to cater for his extra responsibility, but this should be offset by the amount of inside office work eliminated. It may also help recruitment of meter readers.

Pocket calculators or ready reckoners could be supplied to assist the readers.

In a recent article in the ELECTRICAL TIMES it was stated that we have 12,600,000 domestic consumers. Assuming 90% are credit consumers with 4 readings per annum, the stamp saving alone would be £283,500.

This system could also be applied to the "Gas Boards" and thus effect still greater National Economy.

E. R. Judd.
SOUTHALL, MIDDLESEX.

Cable Problem

DESPITE approaches to numerous cable manufacturers, we are having great difficulty in locating a supply of heat-resisting insulated flexible conductors.

The brief specification of our requirements is as follows: Maximum "spot" temperatures 400° C approx.; average ambient temperature 200° C approx. Current carrying capacity not less than 8 amps. Stranded pure nickel or nickel alloy conductors are preferred, as certain connections are made within the high-ambient-temperature area, and copper conductors have been found to oxidise at these connections, causing high contact-resistance, increased heating and ultimate failure. Nickel has been proved free from this trouble.

Ceramic beads are an obvious answer, and electrically are perfectly satisfactory, as is their heat-resistance, but we should much prefer an insulation which is less subject to mechanical damage. Can any of your readers help us?

R. C. Elliott,
C. H. Blackburn and Co.,
GRAY'S INN ROAD, LONDON, W.C.1.

Nuclear Power Limitations

SOLUTION to many of the problems of nuclear energy electricity generation rests with the metallurgist. This was the outstanding point made last week by Sir John Cockcroft, director of the Atomic Energy Research Establishment, in delivering the 61st James Forrest lecture to the Institution of Civil Engineers last week. He explained that in the Calder Hall type of reactor, for example, the limit to temperature of operation was set by the risk of distortion of the sheaths of fuel rods, due to the generation of fission products within them, and by the risk of corrosion of the sheath. There was a move away from aluminium as a sheathing material, towards a magnesium alloy. Again, it was rod strength and distortion which acted to limit the period for which a fuel rod could be allowed to operate in a reactor before it was withdrawn for processing.

At the present stage of development, Sir John said, A.E.A. metallurgists believed that they could obtain from one ton of uranium the heat equivalent of 10,000 tons of coal. It should be possible to increase this to the equivalent of 100,000 tons by various developments, but the real aim was 1,000,000 tons of coal, and this would involve breeding reactors.

British reactor development was at present concerned with the gas-cooled graphite-moderated reactor, but more advanced types were under consideration. The United States, he said, was going to an ordinary-water moderated reactor for its first full-scale power production, with a 60 MW station using uranium and ordinary water contained in a pressure drum of about 10 ft diameter. A heat interchanger would be used, and it was possible that the steam would be superheated by ordinary fuels to give a thermal efficiency of 29% for the heat cycle. Plans existed to follow-up this with reactors of 100, 180, and 250 MW. Boiling water reactors, in which the steam was generated within the reactor and fed directly to the turbine were also under investigation. If attempts were made to get such a reactor to misbehave, then the additional boiling with formation of steam bubbles in place of water tended to make the reactor shut down.

The trouble with water systems, Sir John said, concerned the fuel elements, and came back to the metallurgist again. Even though the corrosion troubles associated with the sheathing were overcome, as was possible using a zirconium alloy, there was still concern with what would happen if a weld failed and the uranium and fission products were let into the water. It might be possible to get over this by alloying the uranium, perhaps with molybdenum, but then the chemists responsible for the processing of the fuel bars after use ran into trouble.

Speaking of the "fast" breeder reactor, of the type being built at Dounreay, Sir John said that this was a physicist's dream but an engineer's nightmare, because of the quantity of heat that had to be extracted from a very small volume and because bombardment with neutrons was very intense.

To develop materials for use in reactors, much testing in high neutron fluxes was necessary. A new reactor being built at Harwell for this purpose would have eight "loops" travelling through the high neutron flux section. It would be possible to circulate through these liquids such as might be used for cooling reactors, and the uranium compounds in liquid or slurry form which might be used in so-called homogeneous reactors, in which fuel and working fluid were mixed up. Sir John referred to the problem of disposal of radioactive waste. He said that provided certain long-half-life isotopes were separated from the other waste, this would not be a great problem, and would add only 1—2% to the cost of running a nuclear station.

Regenerative Deceleration of d.c. motors

ESTABLISHED PRINCIPLES AND A NEW METHOD

By R. WELLS, M.I.E.E.

A MOTOR and the load to which it is coupled, together possess a certain amount of kinetic energy when in motion. This energy is imparted to them from the supply system by virtue of the fact that during the accelerating period the electrical power taken from the system at any instant is greater than it would be if the speed were constant at this instant, and by virtue of the fact that this extra energy is converted from the electrical to the mechanical form by the motor itself.

Two factors worthy of consideration emerge from the foregoing statement and both of them can have a good deal of bearing on many industrial and traction variable speed drives. Firstly, the supply system must normally have sufficient capacity to deal with this "accelerating power." Secondly, the motor and its load have been given a certain amount of mechanical energy which at least in part is reconvertible during the decelerating period.

The purpose of this article is to review the regenerative characteristic of the various types of d.c. motor and methods of regenerative operation, and in particular, to describe a newly developed technique in this field.

All types of d.c. motors as used for both normal and variable speed drives may be arranged for rheostatic braking. This simply involves disconnecting the motor (either as a whole or the armature circuit separately) from the supply and connecting a resistor across its armature circuit terminals. By this means the motor functions as a generator driven during deceleration by the kinetic energy of the motor and its coupled load—but here, of course, the mechanical energy is immediately converted to heat energy and while this is performed by the agency of regenerated electricity this is not what is understood by regenerative braking. Whilst rheostatic braking is used for some traction and industrial applications to provide both normal and emergency braking facilities, the sole advantage which can be claimed for it is that it gives a decelerating means independent of normal friction brakes (although these are usually provided as well) and thereby eliminates or reduces normal brake shoe and brake drum wear and consequent maintenance—the kinetic energy being wasted nevertheless.

General Conditions for Regeneration

A motor is said to be regenerating, when, with its armature circuit remaining connected to the supply system, its back e.m.f. is greater than the supply voltage, and it is supplying a reverse current. The back e.m.f. may become greater than the supply voltage either by its own value increasing due to an increase of field strength, or simply by a decrease of supply voltage. In either case it will normally be the natural consequence of a controlling action calculated to diminish the speed of a variable speed motor.

The plain series motor is not capable of regenerative operation because the excitation depends on the load current, which factor prevents reversal of current while the original polarity of the back-e.m.f. is maintained. The series motor may, however, be provided with alternative separate excitation for use during regenerative operation. In this case, the advantages of the series motor for traction and the shunt motor for braking are both retained. Shunt motors inherently give regenerative operation from maximum to base speed where field control is used and from base speed to minimum where supply voltage control is used, but not where armature resistance control is used.

Compound Motor

The compound motor may be speed controlled by any of the methods suitable for series or shunt motors. Its performance characteristic, however, will depend entirely upon the degree and sense of compounding used, and upon the consideration that when regenerating the effect of the series field, will, in the absence of field reversing, be opposite to that when motoring. If cumulative compounding is used the machine will operate more nearly as a series motor but when regenerating it will have a drooping voltage characteristic. If differential compounding is used the machine will have a more level speed/load curve when motoring, and when regenerating it will have a rising voltage characteristic. From this, it will be understood that the choice of how much compounding and in what sense depends upon the application, the type of load, and the effect required when regenerating.

In practice regenerating compound motors of the cumulative type are used for such applications as trolleybuses

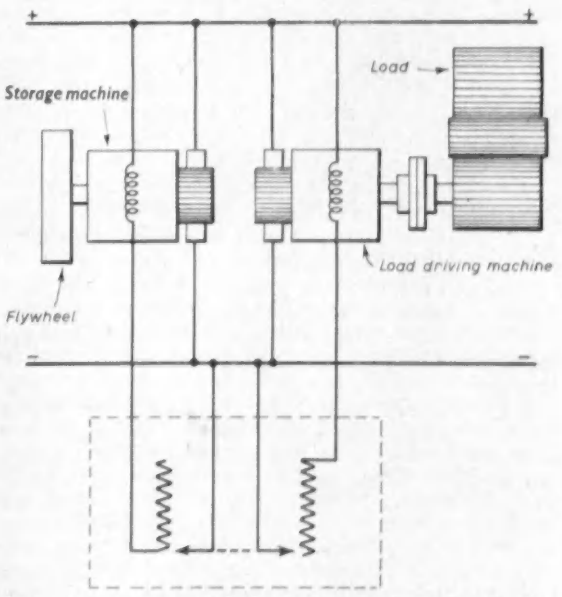


Fig. 1. Basis of proposed two-machine regenerative circuit. Note that resistors are graded as shown in Fig. 2

and arranged as follows give a satisfactory performance both as regards starting torque, speed range, and ability to regenerate are concerned. Starting is effected by series resistors under conditions of full shunt field—thereby limiting regenerative braking to the maximum to base speed range. The series resistors are then cut out in steps to bring the motor up to its base speed. Thereafter, shunt field weakening is used to further increase the speed up to maximum where the shunt field is open-circuited. It should be noted that unlike the shunt motor which can only be operated over an excitation range of about 3 to 1, the compound motor may be operated over an unlimited shunt excitation range because excitation is provided by the series field when finally the shunt field is opened. Deceleration is effected by reversing this control sequence whereupon regeneration takes place down to the base speed at full shunt field. It should here be noted that if, for example, shunt field control gives a speed range of 4 to 1 then the corresponding range of kinetic energy will be 16 to 1 so that potentially 15/16th of the kinetic energy is recoverable by regeneration.

Thus all types of d.c. motors may be rheostatically braked to eliminate or reduce brake wear, while all types except true series are capable of regenerative operation from maximum to base speed where the supply is constant voltage, or lower and even down to zero speed where the supply voltage is variable. It is now proposed to consider the various ways in which the energy recovered during deceleration may be used as decided by the various forms the receptive circuit and the supply system may take.

Direct Supply

Where a locally generated d.c. supply is used direct, regenerated energy is distributed to other loads on the system, thereby relieving the generators during the time involved. If there is any possibility of the total regenerated current (due perhaps to two or more motors regenerating simultaneously) exceeding the total forward current at any instant, then safeguards must be taken against the consequential rise of system voltage, reverse generator current, and tendency to overdrive the prime movers. One such safeguard may comprise an absorption resistor for automatic connection across the busbars; and this piece of apparatus must be very reliable, very quick acting, and pass sufficient current; for the result of unabsorbed regeneration is a high system voltage which can cause much damage. Another safeguard may comprise a low setting reverse current trip on the generator circuit-breaker, which will prevent overdrive of the prime-mover.

Ward-Leonard Supply

Ward-Leonard sets may be used to supply individual motors and their use offers the advantages that speed control by armature voltage variation is obtained without the use of series resistors, and regeneration takes place over the whole speed range, and the energy involved is fed back to the supply system from which the Ward-Leonard set is operating. Where the Ward-Leonard set operates from a local d.c. supply as previously described then the safeguards mentioned may need to be incorporated, but where the set operates from public a.c. mains this will not be required. In a drive where frequent stops and starts are required on a load of high inertia the Ward-Leonard set (or its static equivalent) becomes almost an economic necessity. It is further used to good advantage on reversing drives, where its ability to give regenerative braking down to zero speed (and plugging if need be), and its ability to reverse polarity, by field reversal, make rapid and frequent reversals possible with good economy. The Ward-Leonard set may be flywheel loaded (when it becomes known as an Ilgner set) and in this form has the additional advantage that the peaks of accelerating and decelerating power are reduced in magnitude and spread out in time at least as far as the supply system is concerned.

Rectifier Supplies

As with direct supply, motors operating from a constant voltage rectifier system are limited in regeneration to the maximum to base speed range. Other considerations are also the same as with direct supply, except, of course, that due to the irreversible nature of the rectifier it will not pass a reverse current upon regeneration exceeding forward power, and this makes the provision of an automatic absorption resistor somewhat more imperative.

Many individual drives requiring speed control by armature voltage variation are today powered by variable voltage rectifiers. In the case of shunt and compound motors, field control may also be used. However, due to the irreversible characteristic of the rectifier, regeneration cannot take place either above or below base speed, and while a decelerating control action made at a greater rate than the run-down time will cause the back e.m.f. to be higher than the armature supply voltage, no reverse current will flow. Therefore, while this arrangement is the equivalent of the Ward-Leonard set as far as speed control is concerned, it does not allow of regenerative braking of the associated motor, also, because of its fixed polarity, it does not allow of reversal without main circuit switching as does the Ward-Leonard set.

Where all the motors operating from a constant voltage rectifier supply are capable of regeneration and there exists a distinct probability that frequent and considerable blocks of reverse energy must be dealt with (such as in some traction applications) it becomes necessary to pass these surpluses back to the a.c. network. This can be done by the use of static inverters, which, because they are connected to the system oppositely from the rectifier, must either be separate units or rectifier-cum-inverter sets arranged for changeover switching.

Similarly, with an individual motor operating from a variable voltage rectifier supply, if the requirement is for frequent and rapid stops and starts then regeneration must be provided for and an inverter may be used as described above. Reversing drives can be catered for by providing two static converters, each capable of working as a rectifier or an inverter depending on direction of drive.

Rotary Converter Supply

Where regenerating motors are operated on a d.c. system fed by rotary converters (or other rotating machine type converting plant) the conditions are similar to those already described except that even if at some instant the regenerated current is greater than the forward current, no dangerous condition arises because the converters will inherently operate as inverters to pass the excess back to the a.c. network—thus making absorption resistors and reverse current trips unnecessary.

Storing the Recovered Energy

It has now been shown that the kinetic energy given up during deceleration may be dissipated in resistors to reduce brake wear, that it may be distributed amongst other loads for useful consumption or credited back to the supply system and in both cases maintain the advantage of reduced brake wear, and it is now proposed to show that

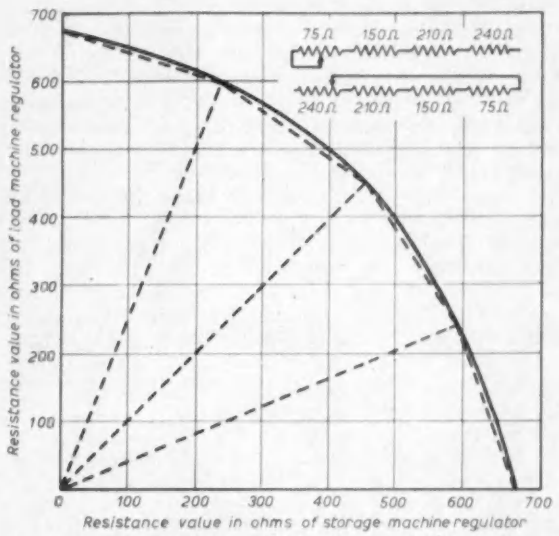


Fig. 2. Relationship of shunt field regulator needed to give correct field current for speed relationship $N_S^2 + N_L^2 = constant$

it can be put to still better use. It has been recognised before that if the kinetic energy of a motor and load in motion could be extracted and stored locally during deceleration, and then re-imparted to the motor and load to provide subsequent acceleration, that no better use could be made of the energy for not only are the previous advantages maintained but in addition the supply system and intermediate apparatus are relieved of the necessity of supplying the accelerating power and of accepting the reverse current. This means that the supply and apparatus may be of smaller rating and that the decelerating operation may be carried out on an irreversible or non-receptive system such as one fed from rectifiers, and with no dangerous rise of voltage taking place. The possible methods whereby the kinetic energy could be extracted are limited (because in decelerating the motor converts the energy to the electrical form) to the following alternatives—(i) secondary battery, (ii) capacitor, (iii) flywheel loaded machine to reconvert the electrical energy to mechanical energy and only (iii) is practicable.

The flywheel loaded Ward-Leonard or Ilgner set, if driven by a motor of drooping-speed-with-load-characteristic so that the flywheel changes speed over a large range during decelerating and accelerating peaks, goes a long way toward the ideal, but it suffers from the disadvantage of comprising two machines additional to the load driving machine (where the available supply is already d.c.) and from the usual disadvantage of using rotary plant for a.c./d.c. conversion where the available supply is a.c.

The ideal can be achieved by the provision of a flywheel loaded machine (in addition to the load driving machine) to take on energy by accelerating while the load is decelerating and vice versa. One application of this principle uses as the additional item a special armature-reaction type machine, changeover switches connecting the load driving machine and the special flywheel machine to the supply mains, or, during the periods of acceleration and deceleration, to each other for the purpose of speed and energy exchange independent of the supply. Control of this arrangement involves many excitation windings on the special machine. An alternative to this arrangement uses a conventional machine (with flywheel attached) for energy storage purposes, but with control from an armature-reaction type exciter, again with several excitation windings. A second variation of this arrangement uses the special armature reaction machine as a d.c. transformer interposed between the supply mains and the load driving machine. By this means the need for changeover switching is avoided, but control becomes more involved and uses not only many excitation windings, but a third excitation regulating machine as well.

The New Method

The new method is of the author's invention (Patent applied for) and while it uses the same basic principle of a flywheel loaded machine as an energy bank, the machine is of a conventional type and operates without changeover switches. The control arrangement while being very simple provides a mutual interchange of speed and energy which is of near perfect matching and which does not involve the use of a third machine.

Fig. 1 shows the arrangement in basic diagrammatic form as it would be for plain shunt machines, omitting for the sake of clarity the series armature resistors (starting, and speed control if required) and other details. As will be seen both the load-driving machine and the storage machine are directly connected to the supply system. During acceleration and deceleration the necessary interchange of speed and energy is effected by circulating currents.

Speed control is effected on a mutually inverse basis by means of oppositely connected shunt field regulators linked for common operation. By this means any deceleration of the load machine is automatically accompanied by an acceleration of the storage machine, and vice versa. If then the load machine field is strengthened for deceleration it will generate a higher back e.m.f. while simultaneously the storage machine field is weakened for acceleration so that it will generate a lower back e.m.f. These changes result in a circulating current of reverse direction in the load machine and of forward direction in the storage machine, and it is the negative power of the first and the positive power of the second which cause deceleration and acceleration respectively—the action, of course, being fully reversible.

The parallel connected storage machine thus provides a receptive circuit of variable conductance, being zero under steady-state conditions and automatically adjusting itself to greater values for greater needs. It is also a receptive circuit which stores the energy imparted to it, so that not only is the supply system relieved of the need to accept reverse current but because the stored energy can be used to accelerate the load machine it is also not called upon to provide "accelerating power." A further advantage of the method is that the energy content of the storage machine cannot become too great or too small because during times when the shunt field regulators are not being moved, its speed will become appropriate to the position of the regulators so that it is suitably prepared for the next adjustment whatever its direction and amount.

For the arrangement to operate at its best, the following quantitative details must be observed. Knowledge of the speed range and moment of inertia of the load gives the maximum and minimum values of kinetic energy. The storage machine and its flywheel need not necessarily possess the same maximum and minimum values of speed and energy as the load machine, but they should possess the same energy difference between maximum and minimum speeds. It follows then that if the aim is to minimise the flywheel size it should be operated over as high and as wide a speed range as possible, and to this end use may be made of gearing between the storage machine and the flywheel and further the maximum excitation range should be used.

Having decided the flywheel speed range and its moment of inertia to give the same energy difference, the total energy possessed by the load and flywheel must be constant for both ends of the control range. Knowing the speed range of both machines, it is a simple matter to decide the total ohmic value of each shunt regulator but it is also necessary for optimum results to so graduate these shunt regulators that when moved in unison the inverse speed change which takes place occurs in such a way that the total kinetic energy remains constant at all intermediate points as well as at both ends—i.e. in such a way that $N_L^2+N_S^2=K$ where N_L is the speed of the load machine and N_S is the speed of the storage machine. Then under steady state conditions the total kinetic energy possessed by the load and storage systems is constant, and it remains only to arrange for both fields to have the same time constant for this condition to obtain under transient conditions as well, so that rapid speed changes become possible with no effect upon the supply system, in spite of the fact that the arrangement is switchless and that both machines remain connected to the supply. This can be done by the addition of an external inductance in series with the field having the lowest time constant.

In order to limit the magnitude of the accelerating and decelerating circulating currents (if desired or found necessary) a limit must be put on the maximum rate at which the field currents can be changed. This may be done mechanically by fitting the unified speed regulator with a time lag device such as a dash-pot, or it may be done electrically by the addition of external inductors in series with the field windings, or it may be done by the means of stepped regulators and sequence controlled contactors.

Experimental Results

To demonstrate the operating principle of this method an experimental rig was set up having separate excitation and the machines supplied from a local mercury arc rectifier, so that apart from the voltmeter, there was no receptive circuit outside the two machines into which a regenerated current could feed.

Because two identical machines were available it was not necessary to go into details of their moment of inertia. To operate them over the same speed range was all that was necessary to ensure that the total energy of the two machines was the same at both ends of the control. Neither was it necessary to consider the time constants of the fields, which could be assumed equal. The machines in question were 240 V, 21 amp, 5·5 b.h.p. and they were used with interpole windings in circuit.

To graduate the shunt field regulators correctly, it is first necessary to establish the relationship between the speeds of the machines so that $N_L^2+N_S^2=K$ as explained. It was decided to operate the machines over the speed range from base value 850 r.p.m. to 1,850 r.p.m., thus making $K=4{\cdot}145\times10^6$. The next step was to determine by experiment the no load speed/excitation curve of the machines, and with these two curves to hand, it is a simple matter to establish the correct relationship between the inversely varying field currents. The next step is simply to determine the corresponding relationship between the total shunt field resistance values, and from this subtract the resistance value of the field winding itself in order to arrive at the correct relationship between the shunt field regulators as shown graphically by the curve in Fig. 2. By striking four equal chords on this curve it could be seen that a four section graded sliding resistor would give a good approach to the ideal and this was decided upon with values as shown on the inset to Fig. 2.

The first test was to determine the run down time of the machines from 1,850 r.p.m. to 850 r.p.m. in order to establish the critical time period for a full range control motion —this was found to be 14 seconds. The second test was to check that with only one machine in use the usual symptoms of unabsorbed regeneration were present when the field was strengthened for deceleration. The result of this test was as expected, and it was found that the machine could not be decelerated in any less time than the natural 14 seconds, and that a full range control motion carried out in 10 seconds resulted in the supply voltage being elevated from the normal 240 to 300 during the time it was going on. The results of the third test with the arrangement working as intended were as follows. The machines were tested for no-load armature current and this was found to be 0·75 A at 850 r.p.m. and 1·25 A at 1,850 r.p.m. so that under steady state conditions the current drawn from the supply was 2·0 A with very little variation at the various speeds.

It was found that the unified regulator could safely be moved over the full control range at the highest possible manual speed (about ½ sec.) and during the operation the disturbance to the supply was a transient increase of current from 2·0 to only 4·0 A both during acceleration and deceleration, whilst the voltmeter showed no change of indication. The armature current of this machine showed a swing of +0·75 A/+20 A/+1·25 A during acceleration, and of +1·25 A/−18 A/+0·75 A during deceleration, showing that the peak current of acceleration and deceleration was 19 A. Had the "load" machine been actually loaded in the steady state sense the current drawn from the supply would simply have shown a load component of current varying in the same way and being always of the same magnitude as under steady state conditions, i.e. during acceleration it would be no higher, and during deceleration no lower (at any instant) than it would be under steady conditions and at the same speed.

These accelerating and decelerating tests were continued by introducing resistance into the main supply and at the relatively large value of 10 ohms (representing a supply rectifier of considerable regulation) the machine speeds could still be interchanged at a high rate and with the same values of circulating current, but the disturbance to the system was even less—thus indicating the independence of the action from the supply. Finally, it was observed that upon switching the main supply off, but keeping the separate excitation supply on, the machine speeds could still be interchanged while they were running down.

Operating Similar Machines in Pairs

In some industrial applications where a number of similar machines requiring frequent stopping and starting are concerned, such as centrifuges and calenders, it may be possible to operate them in pairs. One would be decelerated while the other was accelerated, and the running time of No. 1 used to discharge and reload No. 2.

In such a case, the need for a separate storage machine for each load machine will disappear. By this means the arrangement becomes a well balanced see-saw of field current, speed, and kinetic energy, which saves brake wear, avoids wasting the energy of motion, allows the supply system apparatus to have a minimum capacity (its duty being as for an inertia-less load) and allows the operation to be carried out on a non-receptive supply.

The author wishes to thank Mr A. E. Brewer, B.SC.(ENG.), A.M.I.E.E., Head of Electrical Engineering Department, Croydon Polytechnic, for permission to carry out tests in the laboratories of that institution, and also Mr A. M. Hodgson, A.M.I.E.E., F.R.S.A., Senior Lecturer, for assistance in conducting the tests.

APPENDIX

The forms of regeneration described in the foregoing article are associated with changes of kinetic energy of the load. In addition the regenerative condition can arise when the back e.m.f. of a motor exceeds the supply voltage due to an increase of speed caused by over-drive, and this form is usually associated with changes of potential energy of the load. For example, a vehicle running down hill may regenerate in this way when the direction of rotation of the motor will be normal, and crane loads may be lowered under the control of a regenerating motor when the direction will be reverse to normal. Unlike changes of kinetic energy which always takes place within well-defined limits, such changes of potential energy are not well defined and will vary enormously from application to application so that whether or not energy-storage braking can be provided depends for example, in the case of a traction system, upon the route contours.

I.E.S. Publish Revised Code

New version enlarged and broadened to appeal also to Architects and Users

A FIRST impression of the revised edition of the I.E.S. Code for Lighting in Buildings, published last week by the Illuminating Engineering Society, is one of a considerably broadened appeal and, in fact, this valuable publication is now presented in such a form that its use by architects and architectural schools particularly, and by users—factory, office and shop managers—generally should present no great difficulty. Time spent on its study by electrical engineers who are in any way concerned with the provision of lighting in building interiors will be amply rewarded.

The difference in presentation and appeal manifests itself from the start. Whereas the previous (1949) edition launched immediately into its subject by considering natural lighting, the present version provides a brief but valuable introduction to the entire subject, discussing in a general but intelligent manner the fundamental relationships between light and sight. To the layman in illuminating engineering, this section thus provides the necessary background to the subject in its greater detail.

It points out, for example, that, up to a certain point, the higher the illumination level of the "whole field of view" the smaller are the local differences of luminance which the eyes can appreciate and, therefore, the more discriminating and detailed seeing can be. Both the general level of luminance, and the contrast of particular objects, also determines to some extent the speed with which the brain can recognise a given object, of particular importance in visual inspection of similar articles on a moving conveyor. Attention is also drawn to two important reflex adjustments of the eyes which are actuated by the state of illumination. One is the well-known "light-reflex," which adjusts the pupil aperture to the level of luminance, and the other the "fixation-reflex" which automatically causes the gaze to be directed to objects in the field of view which are of relatively high luminance. Where the area of high luminance is that which ought to be specially observed—a workpiece for example—the fixation reflex assists concentration. On the other hand, if the high luminance area is an over-bright light source, the effort required to counteract the fixation reflex means that concentration on the work in hand can only be made under stress, tending to poorer quality workmanship.

Artificial Lighting

Part II, concerned with artificial lighting, again shows this broadening of appeal. Compared with the previous edition, its order of presentation is considerably altered, the overall result being a more logical sequence in which general principles precede more detailed design considerations. Specific recommendations, however, remain largely unaltered—the desirable general illumination over the working plane is again recommended to be at least 6 lm/sq ft, whilst the variation of illumination over particular areas should be such that the ratio of minimum to maximum does not exceed 1·5.

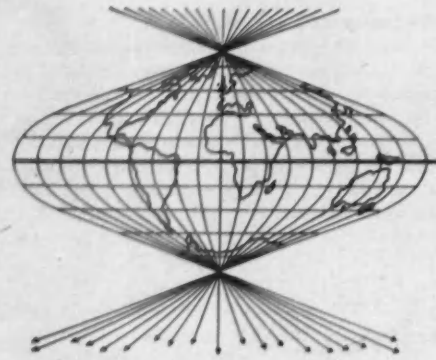
Avoiding Glare

The section devoted to avoidance of glare reflects both the widened appeal and recent ideas on and knowledge of this subject, particularly in the recommendations for maximum permissible values of average luminance for light sources, which imposes somewhat greater restrictions. Whereas the 1949 edition catered for only two classes of planned illumination on the working plane, either less or more than 10 lm/sq ft, the new code specifies less than 15, 15 to 50, and over 50 lm/sq ft, for luminaires of projected areas both less and more than 200 sq in. Because the projected area of luminaires was not specified in the 1949 edition, an exact comparison of the values given is not possible. A new recommendation designed to minimise glare is that installation design should aim to provide an average illumination on the horizontal working plane at least three times as high as that produced directly by all the visible installed sources on a vertical plane at any occupant's eyes. Moreover, in corridors, stairs lighted at low level (as in cinemas and theatres) no light should be directed upwards from light sources to occupant's eyes.

The illumination scales for both natural and artificial lighting remain unchanged. To facilitate their use, however, they are now provided with an indication of the combinations of degrees of lightness and contrast of the object or material viewed to which each scale applies. Three degrees—high, moderate, and low are given, so that scale A, for example, is appropriate both for a combination of high lightness and medium contrast, and for the reverse conditions.

Natural lighting, previously devoted to Part I, now comes as Part III and is so completely revised as to be an altogether new section. It discusses comprehensively the compution of the natural lighting level, light distribution and reflection, location and design of openings and the balance of brightness between sky and interior concluding with a series of specific recommendations.

No major change is observed in the Code's schedule of recommended values of illumination, and detailed changes, where they occur, are of raising the particular value. As such, the general illumination for drawing offices is now 15 lm/sq ft, as against 10. A few additions are also noted —lighting in power houses now includes a recommendation of 15 lm/sq ft for turbine halls.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Fittings Firms Protest

The Canadian Lamp and Fixture Manufacturers Association, which has about 60 members, is protesting that imports of such goods are hurting the Canadian industry. (U.S. imports are chiefly the trouble, it seems.) In a campaign drawing attention to the matter, the association's president, Mr A. S. Alstedter, declares that "Foreign-made lamps and fixtures containing sub-standard materials are permitted to be sold in Canada, while Canadian manufacturers are not allowed to make such sub-standard goods. As a result, the imports can be sold for less than the local firms' fully approved goods." One official said an increase in tariffs was not wanted, but if the government would add an affidavit to the usual customs import invoice that the goods met all the C.S.A. regulations, the customs officials would not need to check, but if anybody imported sub-standard goods they would be liable for prosecution.

Decade of Service

The British Columbia Power Commission completed its first decade of service a few weeks ago—the Commission was established by the Provincial Government in 1945. Now the Commission serves more than 56,500 consumers in 26 areas defined as power districts, about 60% of the former figure represents new services, homes, businesses and industries which either were not in existence ten years ago or else had no electrical service available. Average domestic consumption on the Commission's system is now 215 units per month compared with 74 units a month in 1947.

Inter-Province Plan

A plan to link the power grid systems of New Brunswick and Nova Scotia, is now under consideration by the two provincial governments. The proposals have been put forward by Mr A. G. Christie, of the Johns Hopkins University, U.S.A. He contends that merging the 660,000 h.p. of developed capacity in the two provinces would result in lower electricity charges. New Brunswick now has a generating capacity of about 333,000 h.p., chiefly in hydro-electric stations, while Nova Scotia's total capacity of around 327,000 h.p. is mainly in the form of steam power stations. It is suggested that the stations should be pooled under a joint power authority, and power would then be fed through an interconnecting h.v. transmission system to which all the stations would contribute. The plan proposes that for the Maritimes there should be large steam power plants and run of the river hydro stations to handle the base loads, with low-cost additions to storage hydro plants to handle the peak loads. The Maritimes' scattered population has made construction and maintenance of transmission lines, it is argued, while generating costs of the present thermal stations are high.

St. Lawrence Power

Preliminary excavation work has begun for the new St. Lawrence transformer station of the Hydro-Electric Power Commission of Ontario at Cornwall. The station eventually will distribute power from the Canadian section of the new St. Lawrence generating station, and will replace the present Cornwall transformer station. The new station will be in service by next Apr., with an initial capacity of 230,000 kVA, and will be fully completed in 1958.

BRITISH GUIANA

More Plant

The first of three 500 kW Fairbanks Morse diesel generating sets have recently been installed at the New Amsterdam Electricity Works, British Guiana. These are being housed in a temporary structure at the moment, until the permanent building is completed, for it was essential that the plant should be placed into commission as quickly as possible to ease the strain on the existing plant.

EUROPE

Economic Plans

A series of economic reforms introduced in a number of decrees by the Government of France have just been announced in the French Journal Officiel. We briefly noted last week the emphasis to be given to the development of nuclear power; the announcement now shows that this decree provides that the Prime Minister may spend Fr. 47,050 millions over the next three years on carrying out the additional programme for nuclear power. Another decree foresees a programme to extend and modernise power stations, with a view to meeting electricity requirements by 1960/61. Expenditure on this for the period 1954/57 is scheduled to reach Fr. 619,000 millions. For the same period Fr. 124,900 millions are earmarked for telecommunications.

PORTUGAL

Portuguese Plan

A plan to provide additional water storage which would enable electricity output to be increased by 370 million units annually, has been put forward to the Portuguese Government by the Company Hidro-Electrica do Cavado. The scheme provides for the erection of an additional dam and reservoir on the Alto Rabagao tributary.

MIDDLE EAST

Jordan Scheme

The revised scheme for utilising the waters of the River Jordan in a multi-purpose scheme seems to be nearer approval with the news that recent discussions in Washington between experts from the U.S.A. and Israel on the technical aspects have resulted in a large measurement of agreement. It is suggested that the Israel Cabinet may next study the amended plan which has been evolved from visits of Mr E. J. Johnston. It will be recalled that one scheme put forward proposed the exploitation of the Litani River, together with the Jordan and the Yarmuk, for irrigating a vast area, and used in a 27,000 kW power station at Adasiya, in Jordan, and a 33,000 kW station at Tel-Hai, in Israel.

AFRICA

Power Scheme

The municipality of Nova Lisboa, Portuguese West Africa, is considering the possibility of establishing its own generating plant to supply the town. At the present time current is taken from the Benguela Railway Co.'s plant. It is estimated that a suitable plant would cost about 6,000 contos.

PUNJAB

Uniform Charges

Following demands of domestic consumers for lower electricity charges, the Punjab Government has decided to introduce a uniform rate for electricity in all the towns of the Province. The rate

will be about 4 annas and 6 pies per unit, we understand. At the present time the rates vary from 5 annas to 8 annas per unit in the different areas.

MALAYA

More Plant

The installation of two 1,250 kW diesel generating sets at Sungei Pinang has just been completed by the Electricity Department of the Muncipality of George Town, Penang. The plant, which was ordered in 1953, has been erected at the Department's existing substation at Sungei Pinang, and is intended to meet the increasing demand locally until the new steam station comes into operation. Mr M. B. Parsons, who is now the municipal electrical engineer, has said that with the new diesel plant, the present restrictions on electric cookers and air conditioning in cinemas would be lifted. The foundation stone for Penang's new steam station was officially laid a short time ago by Mr S. Mortimer immediately prior to his retirement from the position of electrical engineer. We have already noted that the English Electric Co., Ltd., are to supply two 10 MW turbo-alternators and Foster Wheeler Ltd., the two 130 klb/hr boilers. A further three sets may be added at a later date.

AUSTRALIA

Hastening Tully Falls

Unless the Tully Falls hydro-electric scheme was completed next year, Cairns would face serious power restrictions, Mr A. D. Dowsett, assistant manager of the Cairns Regional Electricity Board, Queensland, stated a few days ago. Mr Dowsett warned of the likelihood of some load-shedding in the next few months because of the inability of existing generating plant to meet a progressively increasing peak demand. He said proposals for additional diesel generating plant over past years had been formulated on the assumption that power from Tully Falls would be available not later than June 1955. Peak loads by 1957 could exceed the capacity of available plant by 2,000 to 3,000 kW. If six months could be cut off the construction period at Tully Falls, it would save the Cairns Regional Board more than £100,000 in fuel oil costs, and would effect a saving in the capital cost of the scheme by virtue of reduced capitalisation interest. In his opinion this would amount to about £100,000.

Outburst on Tenders

A reply has been issued to the pronouncement last week by Senator H. Spooner, Australia's Minister of National Development, that when firms were recently invited to quote for the supply of certain electrical equipment for the Snowy Mountains scheme 8 of the 20 firms who submitted tenders were from Britain and all eight submitted the same tender price. Mr Spooner added that although they preferred to buy British the Federal Government chose the lowest tender, which was not from a British manufacturer, (the firm is understood to be A.C.E.C.). A spokesman for the British transformer makers concerned, afterwards explained that of twenty tenders submitted eight were level prices representing a co-operative effort on behalf of those British manufacturers to reduce prices to a minimum to meet world competition. The tender prices were, in fact, below the price quoted by the Belgian firm to whom the order was given. But it is necessary when comparing tenders for such electrical equipment to consider many other factors than initial price, it was added.

Farm Supplies

Although Australia lagged behind the United States and Europe in rural electrification, the Electricity Authority of New South Wales which once thought it would be lucky if only 70% of farms in the State could be electrified, now believed that it was possible to electrify 90% of them, Mr V. J. Brain, chairman of the Authority, has stated. Mr Brain was addressing the annual conference of the Country Women's Association of N.S.W. He emphasised the need to fully utilise the electricity supply not only on the farm but in the house. At the moment, New South Wales was in the lead of all the other States of Australia with 56% of its farms electrified. Since the war this had meant the erection of over 16,000 miles of line.

A Reinvestment ?

The possibility that the General Electric Co. of America might reinvest in Australia, has been raised by the recent visit in Sydney of Mr Philip D. Reed, chairman of the company. Until recently the American concern had a large holding in the Australian General Electric, but American anti-trust laws compelled the company to sell its interest to the General Electric Co., Ltd., of England, which held the balance of the shares. Mr Reed stated that if it was decided to go ahead again it would mean a big dollar investment by the company in Australia, adding that he thought conditions in Australia were becoming more favourable for foreign investors.

NEW ZEALAND

Funds Wanted

The Waitemata Electric Power Board is considering a proposal to raise its tariffs to provide funds for urgent capital works. Mr R. N. White, chairman of the Board's finance and development committee, has said that the Board spent about £60,000 last year from its earnings on capital works. Altogether £150,000 was needed, so that £90,000 more would be required from revenue. The Local Government Loans Board has deferred its decision on the Waitemata Board's application for authority to raise £195,000 for distribution development.

The North Point power station of the Hong Kong Electric Co., illustrated alongside, was first opened in 1921, since when numerous extensions have taken place. Last year two 150 klb/hr boilers were installed, and in recent weeks a further 20 MW turbo-alternator has been brought into commission, the high pressure capacity now totalling 77·5 MW. In addition there is 15 MW of low pressure plant, which, being some 30 years old, is now used only as a standby. We have already reported that the company is drawing up plans for the erection of a new power station at North Point, with an initial capacity of 30 MW, and provision for extension to 180 MW. This new boiler plant is to be oil-fired

Personalities

IN THE INDUSTRY

Due to arrive at Southampton in the *Mauretania* today is **Mr E. R. Wilkinson,** M.I.E.E., M.I.MECH.E., commercial manager of the Central Electricity Authority, who has completed his mission on behalf of the International Bank for Reconstruction and Development. It will be recalled that, at the request of the Government, the C.E.A. agreed to second Mr Wilkinson to the World Bank early last year to undertake that mission in connection with the development and capital requirements of the electricity supply industry in Mexico during the next ten years.

Birlec Ltd., now a subsidiary of A.E.I. Ltd., announce the appointment of **Mr K. L. Moon** as sales manager of their Induction Heating Division. **Mr A. E. Pickles** continues as manager of the Division, with overall responsibility, and **Mr R. Abbot** as technical manager.

Mr J. Blackburn is to retire from the position of district manager at Forest of Dean, to the Midlands Electricity Board, in July next. We understand, however, that he is to continue on special duties at the Board's Central Gloucestershire sub-area headquarters.

Formerly chief product development engineer, Stafford, to the English Electric Co., Ltd., **Mr G. H. Spratt** has been appointed manager of the firm's Meter, Relay and Instrument Division, at Stafford.

We are now able to reproduce below the photograph of **Miss Mary S. Mitchell** who, as we noted last week, has been awarded the 11th Travelling Exhibition by the Caroline Haslett Trust. Miss Mitchell, who is senior demonstrator of the St Pancras district of the London Electricity Board, proposes to study domestic electrification in Belgium, Luxemburg and Denmark, we understand.

Mr R. B. Whalley, who has joined the staff of Metal and Pipeline Endurance, Ltd., as chief welding engineer, was formerly the welding engineer for the Central Electricity Authority, being responsible for the building up, management, and training at the C.E.A.'s national training centre for welders. Mr Whalley has been retained by the C.E.A. as a guest lecturer at courses for station superintendents and engineers in London, we understand.

Under the terms of the scheme to commemorate the late Lord Rutherford of Nelson the Council of the Royal Society has appointed **Mr N. W. Tanner,** a graduate of the University of Melbourne, as a Rutherford Scholar for three years from 1 Oct., 1955 to carry out research in nuclear physics at the Cavendish Laboratory, Cambridge. It also announced that awards under the Royal Society and Nuffield Foundation Commonwealth Bursaries scheme have been awarded to **Dr M. Davies,** senior lecturer in chemistry, University College of Wales, Aberystwyth, to enable him to visit Sydney from Jan. to Sept., 1956 to work in the field of molecular structure, infra-red spectroscopy and dielectric absorption; and to **Professor J. B. Warren,** Physics Department, University of British Columbia, to enable him to visit Canberra from Aug., 1955 to Aug., 1956 to study the photodisintegration of nuclei.

Mr H. J. Podmore has been appointed sales manager of the specialist Dryer Division of Birlec Ltd. **Mr T. C. Sanders** continues as manager, with overall responsibility, and **Mr J. W. Carter** as technical manager of the Division.

As a further stage in its programme of building up an advisory and technical service organisation for separational problems in industry, Sharples Centrifuges Ltd. have made three appointments to its technical staff. **Mr R. T. Collins** is now senior project engineer (Midlands), **Mr G. H. Duffield,** DIP.MECH.E., DIP.CHEM.E., A.M.I.MECH.E., is senior project engineer (northern), and **Mr M. W. Vincent,** B.SC., A.R.I.C., is now especially concerned with all aspects of project development work in the Tower House laboratories at Stroud.

Mr W. F. G. Dean, of Liverpool, and **Mr R. W. Shepherd** of Newcastle-on-Tyne, now represent Ashley Accessories Ltd., and Astral Switchgear Ltd., in the north west and upon the north east coast respectively.

Mr L. D. Gunnell, general sales manager, and **Mr H. G. Carter,** A.C.A., secretary, have been appointed directors of Foster Electrical Supplies Ltd.

Holophane Ltd. announce the following Board re-arrangements and appointments which will take effect on 1 July: **Mr Guy Campbell** has resigned his position as joint managing director but will remain chairman of the company. **Dr S. English** has resigned from his position as joint managing director and also as technical director but will remain on the Board and has been appointed vice-chairman. **Mr C. H. Bansback** (secretary) and **Mr W. T. Souter** have been appointed joint managing directors and **Mr J. G. Holmes** joins the board as technical director.

The Minister of Fuel and Power has appointed **Mr E. J. Hunter,** a director of Swan Hunter and Wigham Richardson, Ltd., as a part-time member of the North Eastern Electricity Board, and re-appointed **Mr G. A. Nott** in a similar capacity to the Midlands Electricity Board. The Minister has also appointed **Alderman the Rev. R. A. Giles,** B.LITT., as chairman of the Midlands Electricity Consultative Council as from 15 Aug., in succession to **Mr R. M. Barrow,** J.P., M.A., who is to retire.

Samuel Fox and Co., Ltd., announce that **Mr G. R. Bolsover,** director and consulting metallurgist, will retire from the company's service on 30 June. In consequence, **Mr R. D. Pollard** has been appointed to the board of directors and becomes director and chief metallurgist as from 1 July. **Mr O. Inman** retires from his position as director of developments on 30 June, but his services, however, are being retained as

Miss M. S. Mitchell

Mr W. F. G. Dean

Mr R. W. Shepherd

Mr L. D. Gunnell

engineering consultant to the company and he will remain a member of the board of directors.

A number of individuals variously associated with the Electrical Industry were elected Members of Parliament at last Thursday's General Election. Among the Conservative members are **Mr G. Nabarro,** who was again returned for Kidderminster; **Mr C. Orr-Ewing,** O.B.E., M.I.E.E. (representing Hendon North), who is commercial adviser on the technical side to A. C. Cossor Ltd., of which he is also a director; **Mr G. Spencer Summers,** a director of John Summers and Sons, who was elected for Aylesbury; **Sir A. Braithwaite,** a director of Electrix Ltd., and of Sterling Electric Holdings Ltd., who is M.P. for Harrow West; **Wing-Commander N. J. Hulbert,** a director of the Metropolitan-Vickers Electrical Export Co., elected for Stockport North; **Mr J. Grimston,** director of Enfield Rolling Mills Ltd., for St Albans; **Mr F. J. Erroll,** A.M.I.E.E., again represents Altrincham and Sale; and **Mr R. L. Mawby,** a maintenance electrician and a member of the E.T.U., is the Conservative member for Totnes. Among those on the Opposition benches are **Mr A. M. F. Palmer,** A.M.I.E.E., editor of the *Electrical Power Engineer,* who was returned for Cleveland; the **Rt. Hon. J. Chuter Ede** (representing South Shields) who was a member of the London and Home Counties Joint Electricity Authority from 1927 to 1946, and president of E.D.A. in 1937; **Mr C. R. Hobson,** M.P. for Keighley, who was for eight years chairman of the Lots Rd and Neasden Power Station Workers' Committee and for six years a member of the employees' side of the J.I.C. for the Electricity Supply Industry; while the **Rt. Hon. R. R. Stokes,** chairman and managing director of Ransomes and Rapier Ltd., again represents Ipswich.

The Electric Construction Co., Ltd., announce the appointment of **Mr A. N. D. Kerr,** A.M.I.E.E., as their district engineer in Bristol, for the Counties of Gloucester, Hereford, and Somerset. After a sandwich course of training at the Northampton Engineering College, Mr Kerr gained experience with A.E.G. and Crompton Parkinson; and later was London Manager for a Birmingham firm. During the war he commanded a mobile workshop overseas and was twice mentioned in despatches. He is a past president of the Old N'ions and has served on the A.S.E.E. Executive Council.

Miss Nona M. Baker, M.B.E., has succeeded the late Miss Beth Card as branch development secretary of the Electrical Association for Women.

The following officers have been elected for the London Students' Section of the I.E.E. for the 1955-56 session: Chairman: **Mr M. H. F. Collins** (British Thomson-Houston Co., Ltd.); Vice-Chairman: **Mr K. W. E. Gravett,** M.SC.(ENG.) (Post Office Research Station, Dollis Hill); and Hon. Secretary: **Mr E. L. Jones,** B.SC. (Edison Swan Electric Co., Ltd.).

The Secretary of State for Scotland has now appointed the Electricity Consultative Council for the South of Scotland district. The chairman of the Council is **Bailie John Sullivan** (as we have already noted), and the deputy chairman is **Mr M. I. H. MacKenzie-Inglis,** J.P. Among the other 25 members are: **Mr George S. Helme,** T.D., A.M.I.E.E (of Lancashire Dynamo and Crypto Ltd.); and **Mr J. Jamieson,** B.SC., M.I.E.E., A.M.I.MECH.E., M.I.H.V.E.

OBITUARY

Mr A. B. Wishart, general manager and a director of Belling and Co., Ltd., died on 24 May. He had been a director of the company since 1951.

Lt.-Col. G. Falk

Lt-Col Geoffrey Falk, T.D., M.I.E.E., a director of Falk, Stadelmann and Co., Ltd., and of Wandleside Cable Works Ltd., died on 24 May. Educated at University College School and at Repton, he gained training at Faraday House and had been with Falk, Stadelmann and Co., since 1922. He was appointed local director in Sept., 1943, and became full director in Jan., 1947.

Mr Harry Rich, managing director of Rich and Pattison (Birmingham) Ltd., died on 22 May. He had been associated with that concern all his business life.

Mr E. Hinton, P.ENG., M.E.I.C., manager of the Bowater Paper Co., Ltd., died in Newfoundland on 7 May. Born at Warwick, England, he was educated and trained as a civil engineer before going to Newfoundland to participate in the original construction of the power development for the Corner Brook Paper Mills. There he later became hydraulic engineer, and in 1938 was appointed assistant manager of the Hydro-Electric Department of the then operating company—Bowater's Newfoundland Pulp and Paper Mills Ltd., and was promoted to manager in 1942.

Mr Albert E. Bone, a director of Watson-Norie Ltd., electrical and mechanical engineers of Newcastle-on-Tyne, has died, aged 64. He had been with that firm for 38 years and was mainly concerned with the re-winding department at Wallsend.

Mr F. E. Filer, who died on 25 May, aged 88, was for over 30 years with Boult, Wade and Tennant, patent agents, and was earlier with Siemens and Ferranti Ltd.

Mr S. G. Castle Russell, M.I.E.E., F.R.E.S., died at Cranleigh, on 28 May, aged 88. He was a consulting engineer for many years.

BRITISH STANDARDS

General Requirements for the Metal-Arc Welding of Weldable Structural Steel Tubes. *B.S. 938:1955. Price 4s.* The previous edition of B.S. 938, prepared at short notice during the war was based largely on B.S. 538 "Metal-arc welding in mild steel as applied to general building construction." This latter standard has since been superseded. The new standard lays down dimensions of welding gaps, thickness of backing rings and other weld details. In addition it deals with electrodes and makes some reference to heat treatment and testing.

Electrically-Heated Blankets. *B.S. 2612: 1955. Price 3s.* In keeping with the introduction of standards to cover domestic appliances, this latest standard provides the maximum possible degree of safety for electrically - heated blankets and secures satisfactory standards of mechanical and electrical construction. It does not deal with electrically-heated mattresses and mattress overlays which are to be the subject of a separate standard.

It applies to blankets connected to a double-wound transformer or operating directly from d.c. or single-phase a.c. mains up to 250 V. Design, construction, loading and temperature control come within the scope of this standard which gives details of markings and tests required.

Electric Coffee Percolators and Brewers for Domestic Use. *B.S. 2607:1955, Price 3s.* Another in the series of standards dealing with domestic appliances, this standard lays down minimum safety requirements for heater elements, which may be either immersion, clamp or separate heater type, and are suitable for operating on voltages ranging from 30 V a.c. or 50 V d.c. to 250 V a.c. or d.c. It includes sections dealing with design and construction, heating elements, safety devices, means of connection and terminal arrangements. Tests for stability, insulation, loading and other characteristics are also included. The method of measuring leakage current is given in an appendix.

Glossary of Acoustical Terms. *B.S. 661: 1955. Price 6s.* The advance in techniques associated with the field of acoustics has been rapid since the introduction, in 1936, of the original standard, and has necessitated this revision. The main changes are in the enlargement of the section on recording and reproduction with particular reference to magnetic wire and tape recorders, and the inclusion of a new section on ultrasonics.

Copies of the above British Standards are available from the Sales Branch, British Standards Institution, 2 Park St, W.1

NEW LITERATURE

Electric Wiring Diagrams

by W. Perren Maycock, M.I.E.E.
Revised by A. Serner, B.SC., A.C.G.I., A.M.I.E.E.

THIS book, which is directed at the practical man, is mainly composed of material from the author's former and larger work *Electric wiring, fittings, switches and lamps.* However, many of the diagrams have been amended to bring them into line with modern practice and conventions, and further diagrams and descriptions of fluorescent lamp circuits have been added.

Divided into three sections the book deals firstly with standard supply authorities' services. Typical connections of lighting and power supplies, and 3-wire d.c. and 3-phase systems together with metering arrangements are detailed. In the second section a discourse on various distribution boards is given, and diagrams of industrial plant connections, such as mercury-arc rectifiers and automatic accumulator equipment for battery charging are given.

The third section is devoted entirely to lamp circuits, starting with simple switch circuits and leading to various arrangements with fluorescent lamps. Published by Pitman and Sons Ltd., 156 pages, 7¼ in. by 5 in. Price 8s. 6d.

Lighting for Colour and Form

by R. Gillespie Williams.

COMBINING, in one volume, a variety of different branches of lighting, this book consequently acquires a multiple appeal to all concerned with decorative or dramatic lighting, and architects and designers, photographers and artists, and engineers and technicians, will each find something for their own use, whilst the treatment is not so specialised that the general reader would find himself out of his depth. From the practical viewpoint, however, the work is American and hence the description of equipment is of limited value to the contractor and installation engineer. On the other hand, the generous use of pictorial material, together with written descriptions, provide for the British illuminating engineer a useful indication of American decorative lighting practice. Procedure of presentation logically divides the book into four parts, the first presenting scientific factors underlying subjects dealt with later. This section provides a lucid discussion of fundamentals particularly useful to those unacquainted with the technicalities of light, and includes a brief reference to colour temperatures and specification. Part 2 is eminently the concern of fittings and control equipment designers although here the nationality of the book is most apparent. From practice to precept in Part 3 is the next step, where principles and rules for the artistic use of directional light, shade and colour are dealt with at length, with a useful reference to the psychological aspects of colour in lighting. In the concluding section, the major concern is practical application of principles discussed in earlier chapters. Published by Pitman, 340 pages, 9 in. by 6 in. Price 45s.

New equipment at Tipton exhibition

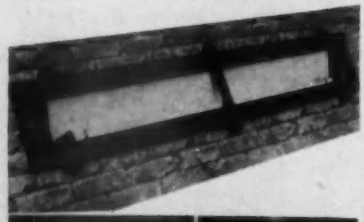
An impressive display of Revo products, seen at the exhibition now being held in their Tipton Works, (see page 924) includes six important introductions.

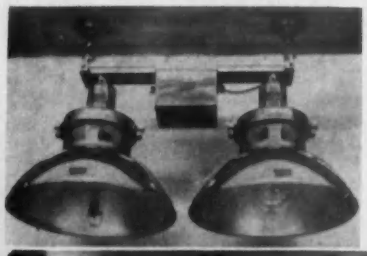
The new type circular bulkhead fitting is made in die-cast aluminium with convex glass front and is supplied in a metallic grey enamelled finish with or without guard, bottom left

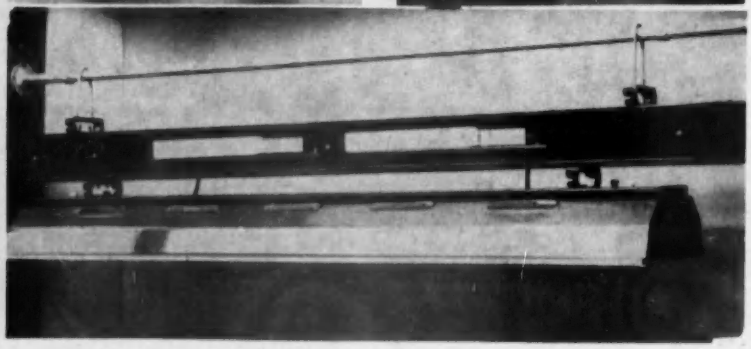
Another exhibit is a new design of dust-proof fitting for 150/200 W tungsten lamp, bottom right, to meet the latest requirements for situations where inflammable or explosive dusts are present. Also on view is a cast iron unit, below, incorporating a 5 ft 80 W fluorescent lamp and control gear, particularly suitable for use in railway locomotive inspection pits. This fitting is designed to the Railway Executive's Specification, having an armoured glass front and capable of withstanding immersion in 3 ft head of water without penetration. Another recent design is a twin reflector unit housing a 500/1,000 W tungsten and a 250/400 W mercury lamp, together with the necessary control gear, below

Of particular interest is a new type of continuous sheet steel trunking for fluorescent lighting, seen below, designed to house the control gear, and having adequate space for service and supply cables.

One of the latest domestic exhibits is the new Revo "Regent" cooker which has been designed to give the cooking capacity of an extra large model with the space saving advantages of a smaller type. An original and outstanding feature of this cooker is that with the removal of only two screws the body can be hinged forward, providing easy access to all internal points







Warning of Process Abnormalities

IN many processes, it is essential that warnings of abnormal conditions of temperature, pressure, flow, viscosity or other functions should be transmitted to a central control point. Although the equipment which converts the physical conditions into an electrical indication by the closing or opening of a switch is necessarily specialised, there is much advantage in using a common type of equipment at the indication panel. One type of unit designed for this work is the "Litealarm" made by the General Electric Co., Ltd. It is available in two forms, as a two- or three-light unit, and can be adapted for use as either a straightforward alarm, or for combined alarm, indication and control. Functionally it is based on the American Russell and Stoll ("Unilarm") and Crouse-Hindes ("Visualarm") systems, and its overall dimensions are comparable with American equipment despite the "Buxton" requirement of a separate terminal box. Operating voltage is normally 100/130 V, 40/60 c/s, a.c. as standard, although provision can be made for alternative voltages. It conforms to B.S. 229 Groups II and III and has also been certified for use in methane (Group I) atmospheres.

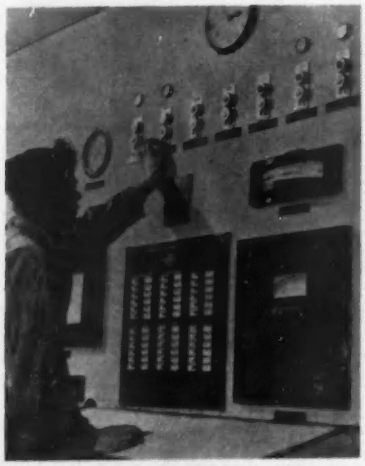
Methods of Operation

One method of use of the "Litealarm" is with an operational system in which abnormality is shown by the opening of normally closed contacts. Under the closed condition, a green light (in the two-unit apparatus) remains alight. When the contacts open the green light is extinguished, a red light starts flashing and a relay closes a hooter circuit. Cancellation of the audible alarm by the centre biased resetting switch leaves the red light in a steady state. As soon as the plant returns to normal, the red light is extinguished and the green light restored.

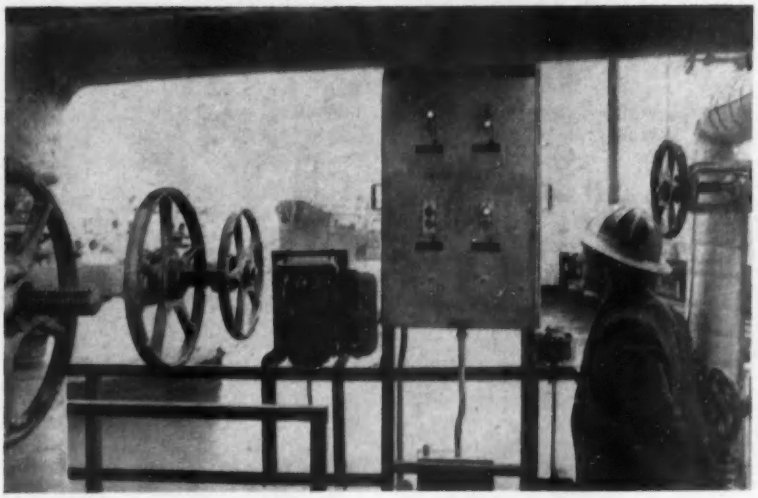
Should two abnormal conditions be present (high and low levels, over and under speed or similar) or for sequence indication, the three-light unit should be used. Where several units are installed together provision can be made for the use of one bell or alarm for all units. All mechanisms and lamps are mounted on a removable panel which can be replaced by a spare unit in the event of a failure, and full testing facilities are provided.

A non-flameproof version is also provided, using identical internal equipment and is of use in factories where both dangerous and normal enclosures exist, as only the same spares need be carried.

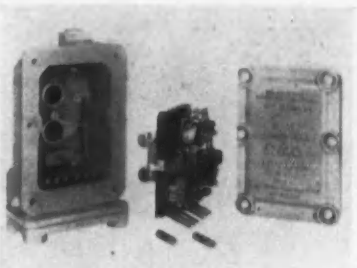
Development of the "Litealarm" was originally for the Esso refinery at Fawley, but installations have been carried out for the B.P., Isle of Grain refinery, for I.C.I. at Billingham, for Anglo Iranian at Aden (in conjunction with Sunvic Controls), and at Dawsholm Gas Works (in conjunction with Electroflo Meters and Newton Chambers).



Above : Alarms on a control panel at Billingham Division of I.C.I.



Below : Units at the control point on the marine terminals at Fawley Refinery

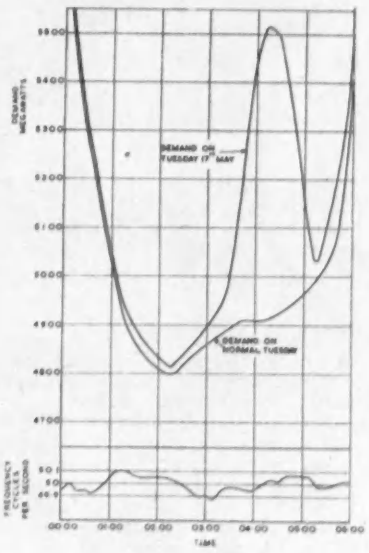


Exploded view of 2-light unit showing how the more vulnerable components are carried on their own chassis

The Listener and the Load

The load chart shown below illustrates the demand which arose on the Grid system as a result of the broadcast of the Cockell-Marciano fight in the early hours of Tuesday, 17 May. It will be seen that whilst the demand was only slightly above normal at 0315 hours, it rose sharply to a peak at 0415 hours. At that time the demand was 605 MW above normal, or 12%, of which 566 MW represented the C.E.A. extra demand and 39 MW the S.E. Scotland extra demand. After the fight the demand fell as rapidly as it had risen. Despite the wide fluctuation in load, the frequency was held constant within very close limits.

Arrangements had been made beforehand for some 860 MW of plant to be available to meet the excess demand, of which 600 MW were immediately available with full boiler backing and 200 MW at 15 minutes' notice.



Equipment for Industry

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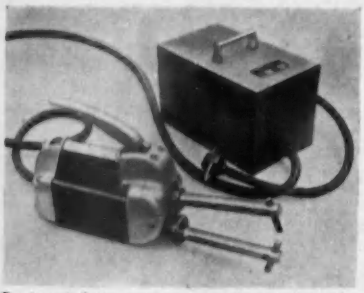
Portable Spot-Welder

FOR spot-welding jobs, carried out in garages and small workshops, the main requirement is that the actual welding equipment shall be portable. A new spot-welder introduced by PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Ave, W.C.2, which meets this requirement, weighs only 20 lb and may be operated from a normal 15 A 3 pin socket-outlet. The equipment consists of a hand welding tool and transformer control box. By a simple movement of the hand grip lever, the upper arm of the welder is brought into contact, dynametric control preventing initiation of the weld until there is correct pressure



Designed for garages or small workshops this equipment weighs only 20 lb

between the electrodes. The actual arms can be adjusted to give an electrode opening of between 1 and 6½ in. and a working length from 4 to 13¼ in. Capacity of the machine is 2 by 14 s.w.g. mild steel plates.

Insulating Varnish Range

DETAILS of the full range of electrical insulating materials manufactured by PINCHIN JOHNSON AND ASSOCIATES LTD., 4 Carlton Gardens, S.W.1, are to be found in their latest publication entitled "Minerva electrical insulating varnishes and compounds." In addition to giving various technical details, the actual techniques involved in applying varnishes are discussed, and examples of equipment treated with the firm's products are illustrated. Copies are available on request to the Insulating Varnish Division at the address noted.

Multi-Contact Arrangement Relay

A VARIETY of contact arrangements is available with the latest type MOL relays manufactured by LONDEX LTD., Anerley Works, 207 Anerley Rd, S.E.20. With up to five sets of "make" or three sets of "break" or changeover contacts the relays are versatile in their application and, should the user desire to change the contact arrangements, since the same basic components are used for all assemblies, this becomes a simple operation.

The body of the relay, moulded from

Up to 5 sets of "make" or 3 sets of break or changeover contacts are available with this Londex relay

high grade insulating material, is designed so that the sections bearing the contact terminals can be removed without disturbing the adjustment. In addition to facilitate replacement of individual contacts, the contact springs are mounted in a moulded block.

Provision is made for fixing the relay by means of two 4BA screws and connection may be by means of screw type terminals on the coil and contacts, or by panel-mounted stud terminals. This latter feature applies only to "make" and "break" contact arrangements.

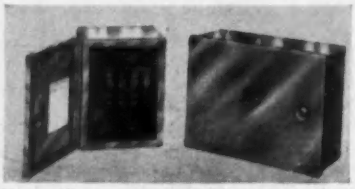
The coil is suitable for operation on voltages up to 450 V a.c. or 165 V d.c. and power required varies between 1 and 3 W. They are fully tropicalised and continuously rated. Overall dimensions of the relay are 3¼ in. by 1⅛ in. by 1⅛ in.

Distribution Boards for m.c.b's.

THE increasing use of miniature circuit-breakers in industry has, logically, created a demand for a full distribution system employing these units. To meet this demand, the M.C.B. Co. (MANCHESTER) LTD., 6 Melrose Ave, Brooklands, Sale, Manchester, makers of the "Lupus" m.c.b., have produced a range of distribution boards, which by virtue of the interlocking plug-in system employed, permits isolation without interrupting the supply.

The distribution boards are made in two sizes either 4- or 6-way, and are accommodated in sheet steel cases. These are made in various sizes to house up to a total of 12 ways, and connection may be single-, double-, or triple-pole and neutral, as required. Up to 30 A rating m.c.b.'s, may be fitted.

The skeleton busbar arrangement, on which m.c.b.'s are mounted, is supported within the case by means of two screws only, which makes for easy removal



Up to 12 ways are available with the latest "Lupus" distribution boxes

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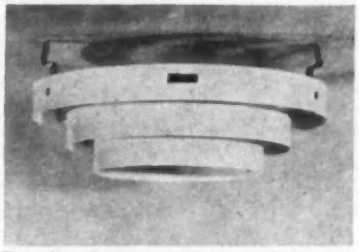

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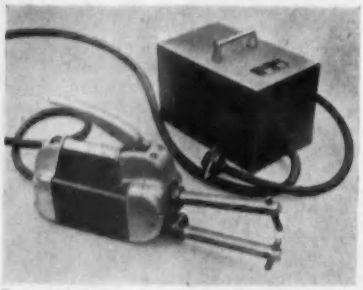
Equipment for Industry

Portable Spot-Welder

FOR spot-welding jobs, carried out in garages and small workshops, the main requirement is that the actual welding equipment shall be portable. A new spot-welder introduced by PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Ave, W.C.2, which meets this requirement, weighs only 20 lb and may be operated from a normal 15 A 3 pin socket-outlet. The equipment consists of a hand welding tool and transformer control box. By a simple movement of the hand grip lever, the upper arm of the welder is brought into contact, dynametric control preventing initiation of the weld until there is correct pressure



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between the electrodes. The actual arms can be adjusted to give an electrode opening of between 1 and 6¾ in. and a working length from 4 to 13¾ in. Capacity of the machine is 2 by 14 s.w.g. mild steel plates.

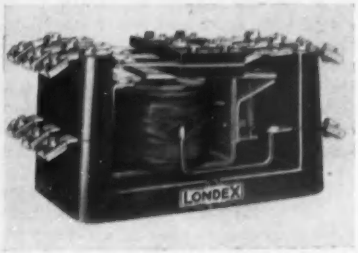
Insulating Varnish Range

DETAILS of the full range of electrical insulating materials manufactured by PINCHIN JOHNSON AND ASSOCIATES LTD., 4 Carlton Gardens, S.W.1, are to be found in their latest publication entitled "Minerva electrical insulating varnishes and compounds." In addition to giving various technical details, the actual techniques involved in applying varnishes are discussed, and examples of equipment treated with the firm's products are illustrated. Copies are available on request to the Insulating Varnish Division at the address noted.

Multi-Contact Arrangement Relay

A VARIETY of contact arrangements is available with the latest type MOL relays manufactured by LONDEX LTD., Anerley Works, 207 Anerley Rd, S.E.20. With up to five sets of "make" or three sets of "break" or changeover contacts the relays are versatile in their application and, should the user desire to change the contact arrangements, since the same basic components are used for all assemblies, this becomes a simple operation.

The body of the relay, moulded from



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high grade insulating material, is designed so that the sections bearing the contact terminals can be removed without disturbing the adjustment. In addition to facilitate replacement of individual contacts, the contact springs are mounted in a moulded block.

Provision is made for fixing the relay by means of two 4BA screws and connection may be by means of screw type terminals on the coil and contacts, or by panel-mounted stud terminals. This latter feature applies only to "make" and "break" contact arrangements.

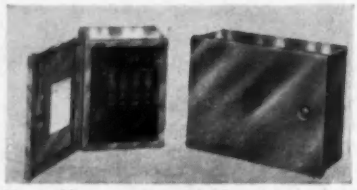
The coil is suitable for operation on voltages up to 450 V a.c. or 165 V d.c. and power required varies between 1 and 3 W. They are fully tropicalised and continuously rated. Overall dimensions of the relay are 3¼ in. by 1⅞ in. by 1⅞ in.

Distribution Boards for m.c.b's.

THE increasing use of miniature circuit-breakers in industry has, logically, created a demand for a full distribution system employing these units. To meet this demand, the M.C.B. Co. (MANCHESTER) LTD., 6 Melrose Ave, Brooklands, Sale, Manchester, makers of the "Lupus" m.c.b., have produced a range of distribution boards, which by virtue of the interlocking plug-in system employed, permits isolation without interrupting the supply.

The distribution boards are made in two sizes either 4- or 6-way, and are accommodated in sheet steel cases. These are made in various sizes to house up to a total of 12 ways, and connection may be single-, double-, or triple-pole and neutral, as required. Up to 30 A rating m.c.b.'s, may be fitted.

The skeleton busbar arrangement, on which m.c.b.'s are mounted, is supported within the case by means of two screws only, which makes for easy removal



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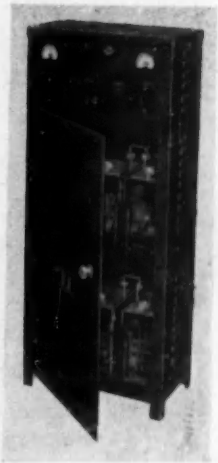

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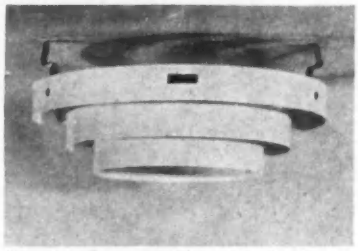

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PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Wiring Aid

FOR the electrician on a building site where t.r.s. or p.v.c. cable is being installed in small type houses, the following suggestion is offered as an aid in clipping. The essential requirement is a small double or even treble compartment clip and nail box made of scrap ends of timber which are plentiful on this type of work. A carrying handle over the top can readily be made from equally plentiful scrap ends of conduit, whilst two such scraps, about 12 in. long when flattened out can be used to make suitable supports on which to hang up the box during the actual clipping. These are bent into a "U" shape—making the inside of the "U" about 3 in. long and two holes drilled in one leg enable the clip to be screwed to nail box. To complete this time-saving equipment all that is needed is a small hammer, usually in the kit, in which a hole is drilled near the end of the shaft. A small piece of cord left over from a pull switch, when placed through the hole, provides a loop just big enough for the wrist.

The application is simple. The box hangs on the side of the floor joist while clipping on the ground floor and on the ceiling joist while clipping in the roof. As is the case on carcase work where there is no floor down and no ceilings up when the electrician is working, and space to keep tools is limited to a scaffold board, the string on the hammer saves many a trip down two ladders and also allows one to let go of same while fixing the cable into position and is always within one's grasp.—*S. E. Cox.*

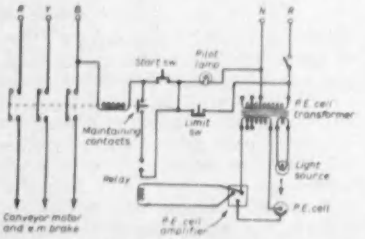
Sticking Contactor

SOME time ago we installed a photo-electric cell control on a conveyor in a "fridge" tunnel. The circuit was arranged so that when a packing case was pushed on to the start platform of the conveyor it obscured the p.e. cell from its light projector source. When the conveyor operator was ready to start, he momentarily pressed the start button and the conveyor began moving, and continued moving so long as the case blocked the light path since the starter contacts were maintained in the on-position by the p.e. cell. The system was designed to enable cases to be spaced at intervals sufficiently close to avoid wasting space yet not so close as to prevent cold air circulating between them. At the same time, while one case was moving, the operator could be filling the next.

In order to prevent the tunnel from being over filled the writer fitted a limit switch to the door at its far end. As shown in the diagram, this switch was connected in series with the starter and also operated a pilot lamp. At the same time, the supply for the coil itself was re-arranged to prevent the conveyor from being started when the p.e. cell was switched off. As shown, one side of the coil was left connected to one of the incoming phases of the motor supply, and the other connected to a second phase through the switch controlling the p.e. cell. The arrangement, moreover, saved cable, an important consideration in West Africa at the time.

The system worked well for a month or so, and then the conveyor failed to stop running when the p.e. cell became unobscured. At first, it would run on by only a few feet, and at infrequent intervals, but after a few days the fault became worse. A few adjustments temporarily removed the trouble but its reappearance before long necessitated further investigation, a task made more difficult by the intermittent nature of the fault, and the need to interfere with production as little as possible.

As "mystic" electronic devices, the p.e. cell and its amplifier were, of course, first suspect, but after they had been exonerated, it was thought leakage in the wiring might be the cause, since the humidity was as high as 95% at times. Finally, however, the source of the trouble was located in the contactor coil, which was holding-on due to a residual current flowing through it and the pilot lamp to neutral. This fault had not been evident at first, as the contactor armature faces being then new, and consequently uneven, required a large current to hold them together. The trouble was further aggravated by the supply, which, being at the time hand regulated at our power station, occasionally rose from its nominal 415 V to 425 V. The difficulty was overcome by fitting an 0·5 W neon lamp in place of the 15 W filament type, and since then no further trouble has been experienced with the contactor.—*D. B. Green.*



Control circuit for the packing case conveyor drive, showing how a circuit was made through the contactor coil by way of the pilot-lamp

Festoon Cable

A PLATE edge planing machine controlled by a push button switch fixed to the operator's travelling platform and tool head was traversed by means of a long screw, the reversals being made by adjustable dogs acting on a reversing switch. Close to the end of the screw were final limit switches to prevent accidental overrun. The control wiring to the travelling head was taken by four contact wires tensioned across the machine, and had originally been medium voltage, but later reduced to 50 V by means of a transformer incorporated in the main switchgear control circuit, the relay coil for which was rewound for low voltage. Whilst from a safety aspect this modification had been commendable, it introduced trouble, for at the lower voltage contact between collectors and contact wire was critical, and resistance introduced by dirt or oxidation was sufficient to allow the contactors to fall out due to the relay under voltage.

The reversing switch operated directional contactors which by their rapid reversal braked the motor at the limit of each working stroke, but when "stopping" the motor by push button a centrifugal switch attached to the motor shaft braked the motor by plugging, until the centrifugal switch opened at near zero speed. Failure of the control relay due to contact wire resistance, however, cut out this plugging effect and allowed the motor to run on its momentum, with the result that when such a failure occurred near the end of the stroke, the final limit switches were ineffective, and the moving head travelled on one occasion to the end of the screw, with consequent damage.

To overcome these failures due to the use of low voltage the four contact wires have now been replaced by a four core t.r.s. flexible cable festooned on insulators across a catenary tensioned in one of the contact wire positions. This system, which is usually recommended for use in corrosive conditions where contact wires for cranes and the like deteriorate rapidly, has proved most suitable for this l.v. application having not only eliminated the trouble, but reduced the frequency of maintenance required to keep the original gear clean.—*T. H. Snelson.*

Single Phasing.—We have learnt from Mr Snelson that his original note on this subject (12 May issue) should have given the current in phase B of the motor as 7·8 A, not 13·5 A as stated. The motor line current was correct at 10·7 A.

NEWS OF THE WEEK

U.K. forced to join Export Credit Race

Manufacturers need not be frightened of Financial Problems

PROBLEMS of the credit race affecting a large proportion of our exports to underdeveloped countries, were dealt with by Mr J. P. Ford speaking at the National Conference of the Society of Commercial Accountants at Leamington Spa. Mr Ford is managing director of three export companies of the Brush Group and chairman of the Institute of Export. He said the demand for credit, especially in respect of capital goods, had grown to an extent where a number of leading industrial nations had been forced into a credit race. The attitude of many overseas customers had almost compelled Britain to enter the credit race or lose business. Mr Ford said although efforts were being made on an international basis to limit extended credits, it appeared obvious that manufacturers in this country would have to continue to offer credit for reasonable periods. He dealt at some length with the various facilities available for financing export trade, opportunities which, he said, were not always known to exist by a large number of prospective exporters.

Mr Ford went on to remind the conference of the availability of the necessary cover for credit trade from the Export Credits Guarantee Dept. Only between 14% and 17% of Britain's export turnover was insured with E.C.G.D., he said. It suggested that too few manufacturers were prepared to face export difficulties which may confront them in certain markets—where the risk could be minimised with E.C.G.D. insurance. It was every manufacturer's duty to increase his exports even if it meant "chancing his arm" in some of the more difficult markets—but where by using E.C.G.D. the only risk run was the manufacturer's own profit margin. Mr Ford concluded by urging intending exporters not to be frightened by the financial problems of export trade.

Geneva Exhibition

CLOSING date for British firms applying for space in the nuclear energy exhibition to be held in Geneva between 8 and 20 Aug., is now 8 June. The new date has been agreed with the Swiss authorities following representations by the British organising committee. It was originally fixed at 25 May. Applications should be sent to Mr N. H. Campbell, Oxford House, 9-15 Oxford St, W.1.

Advisory Service on Welding established

AMERICAN funds for research and advisory work on welding have been allocated to the British Welding Research Association—through the D.S.I.R. The object of granting the funds was to increase British Productivity, and the Welding Association hopes that it will be able to help in solving numerous welding problems and make its knowledge more freely available to industry. To carry out this objective the Association has established a Welding Advisory Dept. at their London headquarters at 29 Park Cres, W.1. This Department will give technical advice where users of welding processes get into difficulties, and encourage the use of welding wherever it might lead to increased productivity. In addition it will be concerned with improving the quality of welding and advising on design for welding.

We hear also that the Association is organising a series of lectures on The Use of Welding to Increase Productivity. The talks will be given in industrial towns all over the country between Oct. and Jan next.

Extensions to Works will produce Meters for Export

A SECOND-FLOOR extension at the Kinbuck (near Dunblane) factory of Smith Meters Ltd. is now in production and is being devoted entirely to the export trade. The extension was opened by Mr T. Johnston, chairman of the N. of Scotland Hydro-Electric Board. Hitherto the production of some 1,500 meters a week has been for the home market, but it is hoped that within 18 months the new department will produce as many for export. Output at the Kinbuck factory is now three times more than it was two years ago.

Current Practice in Fuel Efficiency

A RESIDENTIAL course under the above title is to be held at the Clarendon Laboratory, Oxford, between 26 and 30 Sept. It is being organised by the National Industrial Fuel Efficiency Service and is intended for works and plant engineers. The course is planned to cover the wide field from fuel selection, which is the subject of the first session on the Monday afternoon, through generation to power utilisation. There will be a total of 15 sessions, including two evening periods set aside for general discussion. An industrial visit will be arranged for the Wednesday afternoon. Co-operating in the organisation of the course is the Southern Regional Council for Further Education.

Registration fee including accommodation and meals will be £9. 9s. Applications should be addressed to the course secretary, Mr E. S. Watkin, N.I.F.E.S., Ailsa Hse, 181 King's Rd, Reading, to reach him before 19 Sept.

Atoms for Peace Exhibition will tour Major Cities

A mobile exhibition, designed to feature the peaceful uses of nuclear energy will tour many of the principal cities in the British Isles. It has been arranged by the United States Information Service, in co-operation with the U.K. Atomic Energy Authority. The exhibition opens today (2 June) on a site on the South Bank of the Thames in London, adjoining County Hall. It will remain there until 11 June, official times of opening to the public will be 10 a.m. to 10 p.m. Particular emphasis will be laid on the applications of nuclear energy to industry, agriculture and medicine. Similar exhibitions have already made most successful tours of Italy, Belgium and Holland.

1,710 tons hauled by 80-ton French Electric Loco

DURING tests last month a French Railways electric locomotive, BB 12006, using ignition rectifiers hauled a train of 1,710 metric tons from Lumes to Valenciennes and back on the line between Valenciennes and Charleville, recently electrified for 25 kV, 50 c/s.

Twice during these runs it was successful in starting and hauling this load on a rising gradient of 1 in 100. Maximum effort at the drawbar reached 39 tons with a sustained effort of 35 tons for 21 seconds. The corresponding adhesive factors may be fixed at between 41% and 48% which, for simple adhesion locomotives, may well exceed the best results achieved hitherto. Although this constitutes a remarkable performance for a locomotive of this type, the load hauled is not the heaviest being hauled on that line. Locomotives of the CC 14100 class, weighing 120 tons, have succeeded in starting and hauling trains of well over 2,000 tons on similar gradients.

New Pedestrian Crossing Signals Developed

A NEW type of pedestrian actuated traffic signal has been produced by Automatic Telephone and Electric Co., Ltd. Differing little fundamentally from some such crossings now in use, it has the advantage of being produced more cheaply. Total cost of the new installation is about £385, which compares favourably with the present zebra-crossing which costs about £200, but are claimed to be far less effective and safe. Annual cost of maintenance, including electricity consumption, of the new type should not exceed £80. First of the new signals has been installed on the south side of Vauxhall Bridge in London. A pedestrian on pressing the controller button, changes the traffic signals and obtains right-of-way. A set time of anything between ½ second and 50 seconds can be predetermined to allow people to cross the road. Provision is made to prevent abuse, guarding especially against too frequent use.

OFFICIAL PUBLICATIONS

I.E.S. CODE FOR LIGHTING IN BUILDINGS, 1955 Revision. Available from I.E.S., 32 Victoria St, S.W.1. Price 5s. (See page 913.)

Yorkshire Experiment in Road-Warming

A ROAD-WARMING experiment is being carried out along Whitby Rd on Ormesby Bank, near Middlesbrough. The road has been resurfaced with asphalt and electric elements embedded in it. The elements are connected to the mains supply and build up heat during off-peak periods. The North Riding surveyor, Mr R. Sawtell, commented that they would not be able to draw any definite practical conclusions from the experiments for some time. He added that he did not consider it would be practicable to carry out such a scheme on a large stretch of road surface, or on all severe gradients in the Riding.

Nos. 12-14 Charles Rd, St. Leonards, where the New Homes for Old Exhibition was held, and (right) a corner of the kitchen in Seeboard's flat

Seeboard in New Homes for Old Exhibition

A VERY successful venture at St Leonards-on-Sea concerned with the conversion of large old houses into modern flats, and in which the S.E. Electricity Board took part, will, it is hoped, be the forerunner of a number of similar exhibitions. Three large houses in Charles Rd were acquired by the Corporation for conversion into 18 flats, and to show how this could be done it was decided to stage an exhibition entitled "New Homes for Old" on the premises, Seeboard, the Gas Board, and the Coal Utilisation Council were each offered one of the flats to furnish and equip, and subsequent enquiries and comments confirmed that the all-electric flat was the high-spot of the exhibition.

Total list value of electrical equipment on show was over £600. A wide variety of appliances were exhibited, especially in the Board's own flat, but they also provided lighting fittings throughout the building and placed electric cookers in empty flats open to the public. Seeboard also took part in the film shows. In the all-electric flat a tape recorder was used to provide an explanation of the various appliances installed.

Among the 14,300 people who passed through the flat during the two weeks the exhibition was on, were many representatives of local authorities. Immediate sales amounted to about £500, but the Board estimate the short-term return at anything up to £1,000. The long-term value cannot be assessed, but in view of the continuing housing shortage, the need to convert old houses into modern dwellings, and the availability of Government grants to enable this to be done, Seeboard are hoping that other similar exhibitions will be held and that local authorities will recognise the assistance that electricity can provide.

Part of the exhibition being held now by Revo Electric Co. at their Tipton, Staffs, works. As stated last week, it is a private display of all the firm's products and intended mainly for industrial and public lighting authorities, contractors, wholesalers and retailers. Site of the exhibition is scheduled for cooker production

Interesting Discussions at N.A.L.G.O. Conference?

THE annual conference of the National Association of Local Government Officers' Association, due to be held at Brighton from 7 to 10 June, promises to provide some interesting discussion, judging by the number of resolutions on the agenda. We note that among those relating to electricity supply industry matters, there are several from various N.A.L.G.O. branches seeking the abolition of the lower general clerical scale recently introduced. The revision of scales for female clerks, shorthand typists and machine operators, and the establishment of an overtime rate for administrative and clerical staffs at plain time rate plus 25%, are the subjects of other resolutions. Another suggestion is that superannuation provisions should be amended to enable staff who are members of a pension scheme with a normal retiring age of 60 (or earlier), to exercise an option to retire at 65, or 60 in the case of women.

Appointments Bureau has Most Successful Year

ACTIVITIES of the Professional Engineers Appointments Bureau during 1954 were probably the most successful yet. Particulars of over 9,000 engineers were submitted for vacancies notified in civil, mechanical and electrical engineering, the highest annual number of submissions recorded so far. The Bureau state that this was achieved by taking advantage of every opportunity to submit a selection of candidates to prospective employers. In consequence there have been many placings in all three branches, and with demand for more engineers continuing, it is hoped to maintain the good record attained. There has been an increase in the number of registrations, many from overseas. The Bureau warns that because of the full employment position, many engineers are reluctant to change their employment unless substantial benefits are likely to result. On the electrical side, the Bureau reports that the major proportion of vacancies have called for experience in the sphere of electronics and light current engineering, including instruments. The service has been provided now for nine years and in that time has achieved a high reputation.

M.o.L. Registrations

FIGURES were published recently of the number of vacancies outstanding and the number of persons registered at the Ministry of Labour's Appointment Offices, in selected professions. As regards electrical engineering executives, there were 101 vacancies and a total of 169 registrants, of whom 109 registrants were employed and 60 unemployed.

E.A.W. in Thanet

INAUGURAL meeting of the new Thanet branch of E.A.W. took place last month, presided over by the deputy mayor of Margate, Lt.-Col. C. S. E. Witts. Membership will be drawn from Margate itself, and Ramsgate, Broadstairs, Birchington, Westgate and Cliftonville. Chairman is Mrs M. Carte and hon. secretary Mrs Foskett.

The First Half-Century

The National Electrical Manufacturers' Association has now been officially recognised by the Board of Trade, and has received its certificate of incorporation. Like most young bodies it is ambitious and enterprising, and doubtless a good deal more will be heard of it in the future than in the past, although it has already attracted no small share of attention, notably in connection with the forthcoming Electrical Exhibition at Olympia, which promises to give the electrical industry a much-needed boost. There is plenty of useful work for a body that represents the electrical manufacturers of the country. —*From our issue of 1st June, 1905.*

C.P. begin to send £700,000 of Equipment to Russia

DETAILS of an order for ring main transformer kiosks worth £700,000 placed by Machinoimport, Moscow, with Crompton Parkinson Ltd., were released last week. The contract was one of several secured by Mr J. B. Scott, the company's sales director, when he led a British trade delegation to Russia early last year.

Each kiosk houses h.v. switchgear, a power transformer, and l.v. switchgear in separate compartments. The transformer is a 320 kVA, 6,000 V/400 V, 3-phase unit with star/star connections made by the C. P. associate British Electric Transformer Co. In the l.v. compartment are ten 250 A 400 V, 3-phase feeder units. The actual kiosks are of a strictly functional design. Despatch of the kiosks began in Apr. and will continue on a monthly quota basis. The contract is due to be completed by the end of 1957.

Colour-corrected mercury lamps used in street lighting installation at Blackburn

First Use of New Lamp for Street Lighting

A DECISION to improve on normal street lighting standards in the reconstruction of Blackburn Boulevard led to the choice of the G.E.C's new 400 W colour-corrected mercury fluorescent lamp. This, in fact, was the first application of the lamp for street lighting. Good colour rendering has been achieved by the adoption of recently-developed phosphors. The lamp operates at a high luminous efficiency, average value during life being 42 lumens per watt. The Boulevard is a 'bus station and main road in front of the railway station.

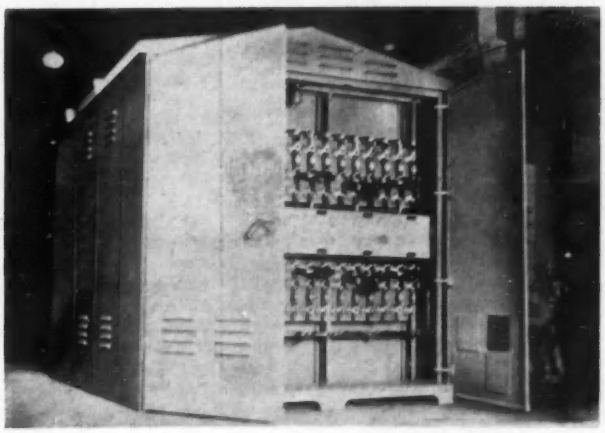
The installation comprises 19 lanterns on double-arm concrete columns. Cut-off lighting was considered desirable and a lantern with a medium-angle beam distribution was selected. The lamp is burned horizontally without a magnetic deflector. Installation was planned and carried out by Mr J. White, chief electrical assistant to Mr W. Pickstone, the borough engineer and surveyor.

New TV Showrooms

THE English Electric Co. have opened new television showrooms at the Queen's Hse, London headquarters. This followed the opening at the same building not so long ago of the new demonstration kitchen. The range of English Electric 21 in. and 17 in. receivers, introduced last month, will be on show.

Court told of Fire 20 Months after Immersion Heater removed

TWENTY months after an immersion heater had been taken out of an airing cupboard a fire broke out there. The householder claimed damages from a Wortley electrical firm at Leeds County Court last week. It was alleged that after the heater had been removed, a pair of wires were left bare. The fire brigade was called and the station officer confirmed the existence of two loose wires which were both sparking at the ends. The defence maintained that all necessary precautions were taken when the heater was removed. The Judge said he thought the plaintiffs were mistaken as regards the wire ends, and gave judgment for the defendants with costs.



Low-voltage end of one of the transformer kiosks being sent to Moscow by Crompton Parkinson as part of a £700,000 order secured during last year's trade visit by British businessmen

One of a number of farm lighting display units produced by Benjamin Electric Ltd., for window displays and agricultural shows. The Duoflux floodlight is wired for a 300 W lamp and can be illuminated. Colourfully produced, this unit has already been booked for extensive use by the S. Eastern, S. Western and Eastern Electricity Boards

Gas Board introduce Maintenance Charge

THE N. Eastern Gas Board is to introduce a charge for an after-sales service for appliances. The Board's decision was approved by the area consultative council just before Whitsun. Increases in wages were said to be the cause of the decision. Dr R. S. Edwards, chairman of the Board, said although charges had been made in the south of England for a number of years it broke with tradition in the N.E. It had been decided to take a general long-term policy and make a charge for maintenance instead of covering it in the overall price of gas. He added that the Board's emergency service would remain free and hoped the new charge would not deter people from reporting cases of escaping gas.

Menus by Telephone

A NEW service has been introduced by Hull Corporation's Telephone Department. It is the Tele-chef, worked in collaboration with the Yorkshire Electricity Board and N.E. Gas Board. On Tuesday, Thursday and Saturday each week, menu hints and cookery recipes are supplied by the Y.E.B. and are recorded in advance by two lady demonstrators of the No. 6 (Hull) sub-area. The Gas Board provide the service on the other three days of the week. In the first six weeks of operation a total of 12,476 calls were made. Press comment on the service has been made in Bermuda, Canada, Cyprus, Egypt, France, Holland, Italy, Malaya, Malta, S. Africa, Sweden and especially in the U.S. We understand that two American radio networks are giving five-minute programmes about tele-chef with typical menus and the B.B.C. Overseas services are considering programmes of excerpts.

Radiators interest Paris

CONSIDERABLE interest in their oil-filled electric radiators was reported by Dimplex Ltd., following their display at the Paris Fair. Notable visitor to the company's stand was the British Ambassador, Sir Gladwin Jebb. The firm showed their entire range of thermostatically-controlled electric radiators, from ½ kW to 2 kW and in eight colour finishes.

Golf in Manchester . . .

THE N.W. (Manchester) qualifying matches in the E.I.B.A. National Golf Competition, held last month, proved most successful both from the sporting, social and financial aspects. There were 130 competitors and a number of non-playing friends present at the course of the Stockport (Torkington) Club. The day's effort resulted in a sum of £200 being raised for Association funds. Prize winners were H. Fletcher (Ferranti trophy) with 63 nett; C. Hill and D. V. C. Pott (runners up in div. 1 and 2 resp.) with 75 and 64 nett; C. H. Hodgson (Best Gross) with 80; W. H. Swain (Veterans) with 72 nett; S. R. Bates (Visitors) with 67 nett; and F. W. Hollings (Putting) with 34. A 12-hole greensomes was won by G. C. Cooper and T. A. Hamilton.

. . . at Edgbaston

MIDLANDS area competition of the E.I.B.A. National Golf Championships will take place at the Edgbaston Golf Club on 8 June. Details may be had from either Mr B. R. Fletcher, 181 Queens Rd, Yardley, Birmingham, or Mr G. Redmond, Crysales Ltd., 100 Charlotte St, Birmingham.

. . . and at East Leake

AREA finals in the E.I.B.A. Golf Championships in the East Midlands are to take place on 6 July at the Rushcliffe Golf Course, East Leake, Notts. Full details in this instance may be obtained from Mr P. M. Furse, hon. secretary, Furse Wholesale Ltd., Traffic St, Nottingham.

Membership of Institute of Physics now 4749

THE Institute of Physics report for 1954, adopted at their annual meeting last week shows that total membership continues to increase steadily and reached 4,749 by the end of the year. In the newly-established Graduate examination only 19 of the 54 candidates were successful. The number of candidates taking final examinations for National Certificates in Applied Physics rose from 206 to 281. As a result of reports of vacancies for undergraduates in physics departments in some universities and large technical colleges, an enquiry is to be made, and similarly, the enquiry seeking information on present occupations of all new graduates in physics of universities is to be continued.

Baker-Hanovia Link-Up

NEW company to be known as Engelhard Industries has been formed with the merger of Hanovia Products Ltd., Hanovia Lamps Ltd., and Baker Platinum Ltd. The last-named company is engaged in the refining and fabrication of precious metals, production of dental golds and amalgam alloys, and laboratory apparatus. Other products include the Deoxo process for catalytic gas purification and the nitroneal generator. Their name will still be used, forming the precious metal division of the new firm. Hanovia Products are engaged in the manufacture of liquid gold and other liquid preparations for the ceramic trade, and will form the ceramic division of the merger company. Hanovia Lamps, manufacturing ultra-violet and infra-red radiation equipment, form the lamps division.

A DERBY WINNER

TWO hundred members of Hoover Ltd.'s staff and their wives, representative of all grades of employees in the sales-service organisation, were invited from all over the U.K. to attend the Derby at Epsom, as guests of the company. They attended an Eve of the Derby Ball, and went on next morning to the race. Next day they toured the company's Perivale works. The outing was a reward for their efforts in the sales-service field.

NEWS IN BRIEF

A resolution has been passed by the Midlands Electricity Consultative Council, asking the Board to reduce electric lighting charges for churches and organisations maintained by voluntary contributions.

Cairn Hydro Hotel at Harrogate will be the venue for the Inst. of Personnel Management's five-day residential study course on Employment and Welfare. The course will be held between 19 and 24 June.

C.E.A.'s collier, *Fulham VI*, claims to be the only collier equipped with a TV set. The set has been tuned to receive programmes from a number of stations on her Tyne-Thames-Barry trips.

Empire Stadium shower rooms, built at Vancouver for last year's British Empire Games, are now heated by G.E.C. thermostatically controlled heavy duty unit heaters.

Following representations by the N.E. Electricity Board, Boldon (Durham) council have rescinded their decision not to install electric cookers and washboilers in houses on a new estate. 50% of those houses will now have the appliances.

British Transport Commission are staging a Steam Locomotive Exhibition at Euston Station, London. It will remain

open for five months; recalls the legendary achievements of steam on rails; and includes models of recent British made electric and diesel locomotives.

C. A. Parsons have obtained an option on 100 acres of land at Longbenton, to be used for industrial purposes.

A booklet "Fire Protection Notes for Office Buildings" has been published by the Fire Protection Association.

British Victor Div. of E. K. Cole Ltd. is supplying Associated Rediffusion Ltd., contractors of the Monday to Friday commercial TV programmes from London, with six 16 mm film projectors.

The B.B.C. have now recognised the Electrical Trades Union as a negotiating body, in addition to the B.B.C. Staff Association, on staff matters in respect of all categories of electricians and their assistants.

At an informal meeting before the annual meeting, Sir Claude Gibb, chairman of Reyrolle's, presented long-service awards to a further 14 employees, bringing the total number of recipients to 93 since the practice was initiated four years ago.

Implement Gold Medal awarded by Devon County Agricultural Soc. has been won by Workman, Reed and Co., Ltd., for their 1955 model diesel fully automatic electric generating set.

Conference on heat flow problems, convened by the Inst. of Welding, took place recently and was attended by about 20 investigators from industry, the Universities and research associations.

At the third annual meeting of Fry's Metal Foundries Ltds.' 25 Club, six qualified for membership bringing the total number of members to 53.

British Railways do not think enough electric razors are being used to justify providing facilities for their use on sleepers. The cost would be enormous they say.

Sayings OF THE WEEK

"The threat for the distant future may arise when capital costs of atomic power plant are repaid or drastically reduced, thereby enabling electrical energy to be produced at a price lower than that of competitive fuels . . ." MR A. V. HORSFALL, of the W. Midlands Gas Board, at the annual meeting of the Institution of Gas Engineers.

"Unlike the towns and cities where people can manage without it, television is a necessity for those people in outlying districts, and many farm workers will turn down jobs if the cottages provided for them are not supplied with electricity for their sets . . ." MR H. P. RENWICK, at the Southern Electricity Consultative Committee meeting.

"A nuclear physicist's dream and an engineer's nightmare is the experimental fast breeder reactor, of the Dounreay type . . ." SIR JOHN COCKCROFT at the James Forrest Lecture of the Institution of Civil Engineers.

ELECTRIC SUPPLY NEWS

Cornwall

A new 11 kV power line is being extended across Bodmin Moor by the South Western Electricity Board, to provide a mains supply to a china clay works near St. Neot. The line will be carried over Berry Down and Muttons Down. The Board's development work in the region was recently visited by Mr S. F. Steward, chairman of the Board. Another scheme about to be undertaken, will take electricity for the first time to rural communities at Lezant, Little Comfort, Regare and Treburly. In this £17,000 scheme nearly 10 miles of mains will be erected, together with 20 substations, to supply over 100 rural premises, including 37 farms.

Durham

Monk Heselden Parish Council has been informed by the North-Eastern Electricity Board that it will cost £2,068 to change the district's electricity supply system from d.c. to a.c. The Council has arranged a special meeting to consider the proposal and also to seek sanction to borrow the money to cover any expenditure necessary.

Eire

Again emphasising that the Electricity Supply Board's rural electrification programme would be speeded up, Mr Sweetman, Minister of Finance, last week announced that in the next three years the number of areas to be developed would reach 100 a year, as against 75 this year, and the number of new consumers would be raised by 40,000 a year. (In the year ended 31 Mar. 1954, the number of new consumers was 23,477, and in the year ended 31 Mar. last, it was 29,812.) The programme would be completed by 1959, and electricity would not be dearer as the result of the withdrawal of the subsidy.

Holsworthy

The capital contributions asked for by the South Western Electricity Board was one of the main reasons which deterred farmers from taking an electricity supply, it was said at last week's meeting of Holsworthy Rural Council, when the question of getting electricity to unconnected parishes was discussed. The surveyor, Mr E. A. Hooper, pointed out, however, that it was not altogether the Board's fault. In one case—at Clawton—at least 60% to 75% support was required before the Board could undertake to provide a supply, but the result of a canvass was so disappointing that it was now uncertain if the scheme would proceed. The Board, he stressed, was not prepared to operate at a loss. After further discussion it was agreed to endeavour to enlist the support of the Rural Councils' Association in the matter.

Inverness

This lovely Scottish city had its first public electricity supply fifty years ago—Edmundson's Electricity Corporation Ltd. being the firm which started the local undertaking which was then known as the North of Scotland Electric Light and Power Co. Ltd.

N. West, Mersey and N. Wales

Since late Jan., 85,000 tons of American coal has been received by the North West, Merseyside and North Wales Division of the C.E.A. for its power stations. Apparently, the Division's coal requirements in recent months have exceeded expectations and supplies from normal sources have become insufficient to maintain consumption and at the same time preserve reserve stocks. The Division's stations most suited to receive the American coal, from the transport economics point of view, are Clarence Dock and Bromborough, but some cargoes have been discharged into wagons for distribution elsewhere, while some cargoes have been unloaded at Birkenhead and at Irwell Park on the Manchester Ship Canal. It is said that the American coal so far received is of superior quality to that normally used by the Division.

North Caledonia

In another step towards the completion of the North of Scotland Hydro-Electric Boards' Strichen development scheme, a power supply was recently switched on at Auchnagatt. This provides electricity to 24 premises in the village and to 42 farms and cottages in the five-mile area between Auchnagatt and Maud. The Strichen scheme, which was started in Apr., 1953, aims to taking electricity to 4,300 homes, farms and halls throughout the north coast. So far 800 of these premises have been connected.

Plymouth

The South Western Electricity Board has given notice of its intention to convert the existing 200/346 V system in Plymouth to the standard 240/415 V supply.

LIGHTING SCHEMES

Bolton. It is proposed to apply for consent to borrow £14,000 for improved lighting on main roads, and bus routes during the financial year 1955-56.

Burton Latimer. The R.D.C. is applying for permission to install fluorescent lighting along the trunk road through Burton Latimer.

Durham. The City Council has applied to the M.O.T. for consent to spend £1,112 on the re-lighting of Neville's Cross Bank.

Fareham. The Borough Council is seeking class A lighting for the main Portsmouth-Southampton road in its area.

COMPANY ACTIVITIES

ONE of the main activities of John Thompson Ltd., of Wolverhampton, is the manufacture of boilers of all types for power stations. In addition to a 10% final dividend as forecast last Feb., the directors are paying an extra 5% bonus. The staff are to get a bonus of one week's basic pay, which is approximately equal to 5% to stockholders. This is a company well worth watching. Group profits for 1954, before depreciation, tax, etc., crossed the £2 millions mark for the first time, an advance of over £500,000. Note also the increased productivity; for the group turnover attained a record £17,345,000, almost £3 millions above the 1953 level.

Despite the quicker work-off of orders the directors are able to report that orders on hand uninvoiced as at the present month are approximately £38 millions, an increase of £1·5 millions over the corresponding figure last year. The directors make the precautionary warning that with increasing competition and rising costs it must not be assumed that a further increase in output, as seems probable, will necessarily produce similar results for the year 1955.

But with the ordinary distribution of 21¼% covered over three times I should be prepared to take a chance at 26s. 6d. for the 5s. stock units, yielding over 4%.

British Insulated Callender's Cables did not escape the difficult times in 1954 which were encountered by most of the big U.K. cable manufacturers. Although group turnover of B.I.C.C. was maintained, trading profits fell by £981,494 to £7,362,580. New chairman Mr W. H. McFadzean blames high and fluctuating copper prices; an uneven load due to buyers holding off orders in the hope of lower copper prices; and intensified competition.

A less important factor, though disturbing, was also the findings of the Monopolies Commission about the cable manufacturing industry, which necessitated some changes in hitherto established practices.

A good start however has been made this year, and the chairman looks forward to a satisfactory time. As regards the longer-term outlook many factors must be taken into account. Selling prices are likely to remain very competitive. The amount of business available changes very quickly. For some goods the group has relatively short order books, and is back to the pre-war position of quick deliveries which in many ways is a favourable factor as it helps abroad. On the whole he expects fluctuations in trading results.

And over a long period he feels that for the electrical industry there must be an expanding demand.

One of the results of the ups and downs in demand which the group is experiencing is the need for a well of capital from which to draw, outside the fixed capital. Mr McFadzean has disclosed that B.I.C.C. has renewed a previous 7-year £2 millions loan with an additional £1 million on attractive terms for a maximum period of 10 years.—*From our City Correspondent.*

Campbell and Isherwood Ltd.

For 1954, the net profit after taxation, etc, is £59,297 compared with £30,553 for the previous year. The dividend is again 15%.

W. Canning and Co. Ltd.

For a long period the company had been handicapped in meeting demands upon its engineering section through inability to recruit sufficiently skilled labour. But with faith in the future, substantial additions are being made to the engineering works, Sir Ernest R. Canning, the chairman, stated at the meeting last week. There has been further expenditure on new machine tools, and the plant and fixtures are now valued at £133,323. The matter that caused anxiety during the record year was the difficulty of supplying customers with sufficient nickel to meet their needs. The prospect of an improvement in the near future appears to depend upon the level at which the U.S. Government continues to take nickel for the defence and stockpile purposes, he added.

Year to 31 Dec.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	517,010	197,164	120	30	32/9	30/–
1951	772,721	246,158	151	35	35/6	31/3
1952	510,606	167,640	97	35	30/1	27/9
1953	608,770	206,168	120	40*	36/–	28/–
1954	740,451	284,480	80	25	24/6	18/10

*Plus 100% capital bonus.

Hall Telephone Accessories Ltd.

Admiralty contracts, which now form a considerable portion of the business, are long term and were incomplete at the end of 1954, and it has not been possible in the year to bring in any profit in that section, Major O. M. Guest, the chairman, explains. The present year opened with a considerable order book, which with expansion in manufacturing space, should lead to a growing trade turnover, he adds.

Harland Engineering Co. Ltd.

At the Alloa works, with the assistance of sub-contract machining, output last year increased by 20% in terms of money value as compared with 1953, Mr H. Cowan-Douglas, the chairman, reports. The order backlog was thus reduced, and total orders in hand at the end of Dec. were valued at about £2,165,000—some £500,000 less than a year earlier. This work will ensure a full activity for 18 months. The order intake last year was well maintained in the standard ranges of electrical and hydraulic plant, in spite of intensive competition. Arrangements for the erection of a new pattern shop are well forward, while the first part of the reorganisation of the test bed has been completed and the second part is planned for 1955. Factory premises at Timperley, near Manchester, have been acquired, for a service spares centre.

Year to 31 Dec.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	337,851	70,640	41	9	6/1	4/9
1951	203,822	65,955	38	10	9/–	6/–
1952	206,013	70,886	39	10	7/9	5/7
1953	217,231	69,487	38	11	8/1	6/8
1954	286,000	99,555	54	14	10/3	7/4

Heatrae Ltd.

For the twelve months ended 28 Feb. last, the net profit, after taxation, is £16,070, compared with £10,529 for the previous year. The dividend is raised by 2½% to 15%.

Southern Areas Electric Corpn. Ltd.

There is to be an increase of 2½%, to 10%, in the dividend for 1954. Consolidated profit for the period is £227,005, compared with £213,129 for the previous twelve months. After all charges, the net profit is £118,943 (*£92,157*).

John Thompson Ltd.

In addition to paying a 10% final dividend there is an extra 5% bonus recommended which the directors consider is warranted by the results for 1954. This distribution is payable on an Ordinary capital which has been increased by a one-for-three "rights" issue and subsequently by a 60% scrip issue. The year's distribution absorbs £221,280, compared with £106,418 taken by the 22½% paid for 1953. The group profit for 1954 amounted to £2,049,591, compared with £1,472,760 for the previous year. After charging taxation, etc., the net profit becomes £777,586 (*£413,168*). Stockholders are warned that with increasing competition and rising costs it must not be assumed that even a further increase in output, as seems probable, will necessarily produce similar results for the current year.

Transformers (Watford) Ltd.

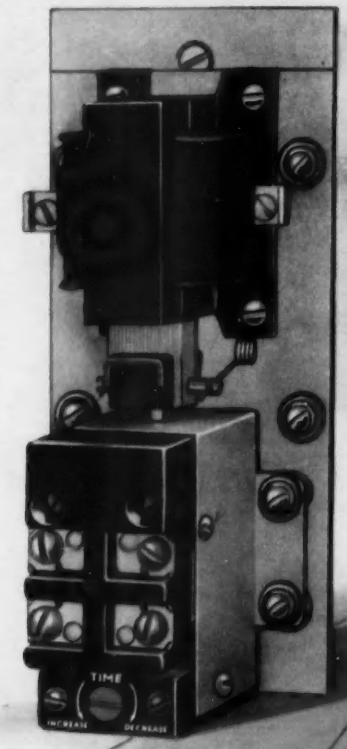
Referring to the activities of this subsidiary of the London Brick Co. Ltd., Mr A. T. Worboys, the chairman, stated that orders received last year were again at a record level, some 50% higher than the previous year. Extensions to the main erection shop have been completed, and transformers up to 35,000 kVA in rating can now be manufactured and tested. Towards the close of the year it became apparent that to cope with the considerable increase of work in progress, additional floor space would have to be provided, and plans are being drawn up for further extensions, he adds.

Dividends Declared

Frederick Braby and Co. Interim 2½% (*same*).

Crompton Parkinson. Interim 4% (5%) but on increased capital.

Dictograph Telephones Ltd. Interim 10% (*same*).



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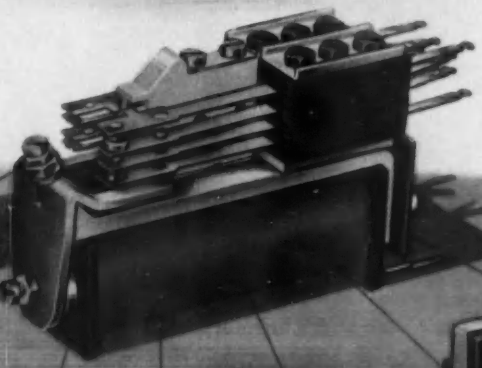

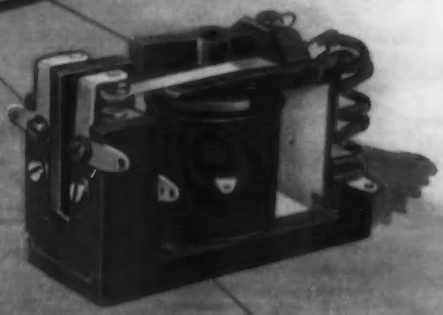

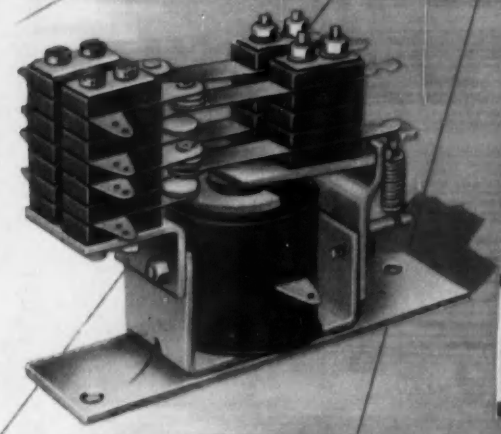

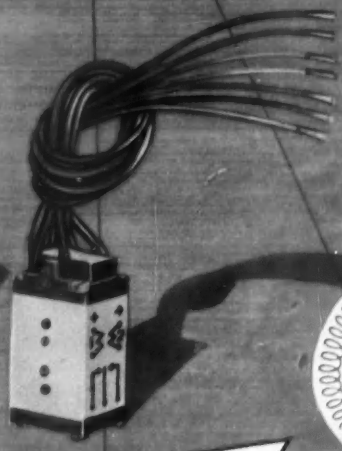

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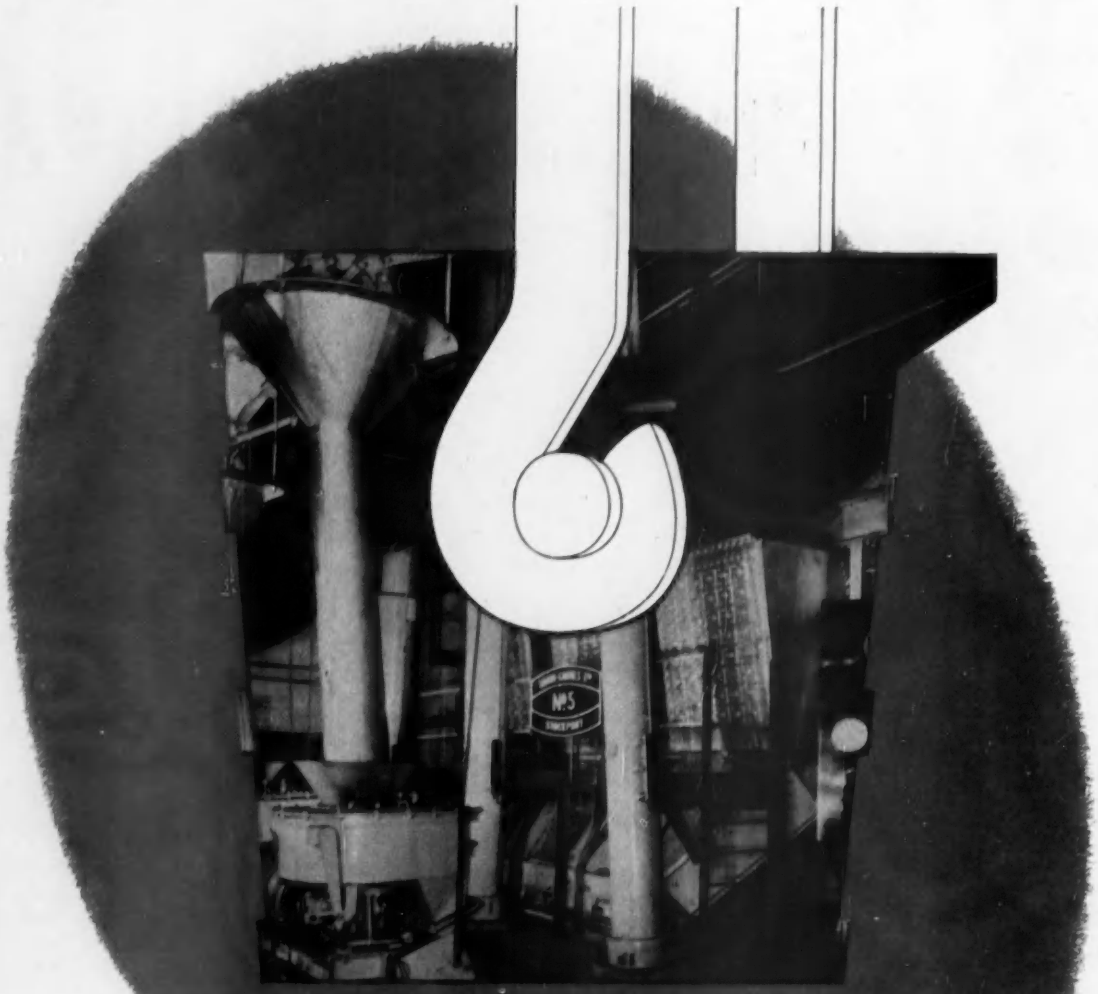

STEAM *and the making of steel*

The general expansion in steel production is making complementary demands on Simon-Carves steam raising plant for electricity generation. Four Simon-Carves 87,200 lb/hr boilers have been installed at the Margam works of the Steel Company of Wales and the picture above shows one of the units in an addition of two 100,000 lb/hr boilers in the Simon-Carves boilerhouse at the Ebbw Vale steelworks of Richard Thomas & Baldwins Ltd.

Steam power by Simon-Carves Ltd

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STOCKPORT, ENGLAND

OVERSEAS COMPANIES | *Simon-Carves (Africa) (Pty) Ltd: Johannesburg* *Simon-Carves (Australia) Pty Ltd: Botany, N.S.W.*

S.C.96

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

3 June—Belfast T.C. CO_2 fire fighting equipment at South Central substation.—Advertised in 28 Apr. issue.

3 June—Heston and Isleworth T.C. Steel columns and mercury vapour lanterns, lamps and control gear, for group A lighting along Bath Rd.—Advertised in 19 May issue.

4 June—Altrincham T.C. HPMV lamps, lanterns, auxiliary equipment, etc., along Oxford and Hale Rds.—See 26 May issue.

6 June—Bushey U.D.C. Concrete columns, brackets, sodium lanterns, lamps, wiring, etc., along Elstree Rd and Aldenham Rd/Hertspring Lane.—Advertised in 12 May issue.

6 June—Knaresborough U.D.C. Fluorescent and filament lamps (group B) with columns, etc.—See 19 May issue.

6 June—Peterlee. Installation in 210 houses on Acre Rigg sites.—See 19 May issue.

6 June—Southgate B.C. Street lighting equipment under two contracts.—Advertised in 5 May issue.

6 June—Sunderland T.C. Installation in shops and flats on Thorney Close estate.—See 26 May issue.

7 June—Irlam U.D.C. Group A lighting including columns, lanterns, sodium lamps, control gear.—See 19 May issue.

7 June—Manchester T.C. Installation in dwellings at Brooklands and Peel Hall.—Advertised in 12 May issue.

7 June—Newmarket U.D.C. Group A fluorescent street lighting units on steel columns, and Group B tungsten units on concrete columns.—See 19 May issue.

7 June — Wellington (Salop) U.D.C. Electrical installation in 64 council houses. Engineer and Surveyor, 14 Walker St.

8 June—Derby T.C. Installation in 46 bungalows on Mackworth estate.—See 19 May issue.

8 June—Sedgley U.D.C. Concrete columns with mercury lighting equipment for class B street lighting on Stickley Lane site.—See 26 May issue.

8 June—Tillicoultry T.C. Concrete columns with sodium discharge lamps along A.91 and A.903.—See 19 May issue.

9 June—Co. Down. Installation at Glastry Intermediate school.—See 19 May issue.

9 June—Edmonton T.C. Supply and erection of 105 concrete columns and mercury vapour lamps, etc., for group A lighting along Great Cambridge Rd. Borough Engineer and Surveyor, Town Hall, N.9. Deposit £2. 2s.

9 June—Enniskillen (N.I). Installation at Convent of Mercy grammar school.—See 26 May issue.

10 June—Inverness. Lamps for Craig Dunain Hospital Board, in year from 1 July.—See 26 May issue.

11 June—Glasgow. Supply of cables, lamps and electrodes for Clyde Navigation Trust in year from 1 July. Stores Superintendent, No. 1 Graving Dock, Glasgow, S.W.1.

11 June—Wilenhall U.D.C. Supply and erection of 40 concrete columns, lanterns, lamps, control gear, etc., for class A mercury discharge lighting in Moseley Rd, and 14 similar units at Fibbersley. Engineer and Surveyor, Town Hall.

13 June—Dewsbury T.C. Rewiring at two schools.—See 26 May issue.

13 June—N. Ireland. Installation in county intermediate school at Cloundagh, Portadown.—See 5 May issue.

13 June — Oldbury T.C. Concrete columns, time switches, and H.P.M.V. lamps, etc.—See 26 May issue.

13 June—West Riding. Maintenance of refrigerators.—Advertised in 12 May issue.

15 June—Swansea T.C. Installation at Mynyddbach county secondary school.—Advertised in 26 May issue.

16 June—Newbury T.C. Electrical installation in 34 council houses in Cromwell Rd, and 32 in St. Michael's Rd. Borough Surveyor, Municipal Buildings.

16 June—Watford T.C. Improved lighting at the town hall.—Advertised in 19 May issue.

17 June—Belfast T.C. Condenser tubes, tube plate ferrules and packing.—Advertised in 26 May issue.

17 June—Carlisle T.C. Electrical installation in Margaret Sewell school extension. City Surveyor, 18 Fisher St.

17 June—Morley T.C. Sodium lighting units along A.643.—Advertised in 26 May issue.

20 June—New Windsor T.C. Concrete columns, totally enclosed side-entry lanterns, auxiliary gear, etc., for sodium vapour street lighting in class A along Clarence, Dedworth and Winkfield Rds, and in class B along adjacent side streets. Borough Engineer, Kipling Building, Alma Rd.

22 June—Cornwall. Low- and high-lift pumps, electric motors and equipment for Fowey River Water Committee.—See 26 May issue.

23 June—Manchester T.C. Installation in Home for Aged in Sale Rd.—Advertised in 19 May issue.

27 June—West Riding. Renewal of electrical installation at Skipton girls' grammar school. Apply by 8 June to County Architects, Bishopsgarth, Westfield Rd, Wakefield. Deposit £1. 1s.

28 June—Goole T.C. 300 kVA diesel alternator and duplicate busbar switchgear.—See 19 May issue.

29 June—Lisburn (Antrim). Electrical installation in new intermediate school for girls at Forthill. J. McCandless, consulting engineer, 6 Murray St, Belfast. Deposit £3. 3s.

30 June—Farington (Lancs) P.C. Street lighting installation in parish.—See 26 May issue.

5 July—Bedlington (Northumb) U.D.C. Supply and fixing of three vertical spindle unchokeable centrifugal pumps, driven by electric motors. Engineer and Surveyor, Council Offices.

9 July—Co. Louth. Pumping and water filtration plant in supply system for villages of Louth, Mullacrew and Tallanstown.—See 12 May issue.

No date stated—Huntly (Aberdeen) T.C. Steel columns, lanterns, lamps and auxiliary gear for sodium lighting along A.96.—See 26 May issue.

No date stated—Leven T.C. Installation in 174 houses on Broom site.—See 26 May issue.

No date stated—N. of Scotland H.E. Board. Submarine cables between number of islands in Outer Hebrides.—Advertised in 26 May issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

16 June—Kenya. Supply of Class A street lighting equipment, including lanterns, lamps and poles, for installation in Railway, Kichwele, Arab and Sultan Sts. Municipal Engineer, Town Hall, Dar es Salaam.

16 June—Tanganyika. Class A street lighting in reconstruction of Main Ave, Dar es Salaam, including columns, lamps and fittings. Municipal Engineer, Town Hall.

21 June—Uruguay. Supply of 13,000 metres of armoured cables for underground installation for 220 V 50 cycles supply, and 425 metres flexible cable for portable equipment; and complementary material. Administracion Nacional de Combustibles, Alcohol y Portland. B.o.T. (Ref.: ESB 11214/55).*

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 105 queries answered this week

Electric drive conversion units for lawnmowers, makers of? T.R. — Power Appliances, 49 Waverley Rd, Ewell, Surrey; Alpha Machine Tools Ltd., Avenue Works, Gidea Park, Romford; Wickstead, Meridian Works, Royston, Herts.

"Warrior" stocks and dies, makers of? D.E.—Nuckey Scott and Co., Lea Valley Rd, Ponders End, Middlesex.

Pear switch permitting 4 degrees of light for use with bed head and bedroom lighting either one on/two on/two off, makers of? C.J.M.—The Edison Swan Electric Co., Ltd., 155 Charing Cross Rd, W.C.2, manufacture the 2-way b.c. adaptor—"Eitherlite" Cat. No. 6014 with a 4 position rotary suspension switch suitable for the purpose.

Set of adaptors suitable for small appliances in American, Continental and British gauges—2 pin and lampholder types, makers of? B.E.C.—Remington Rand Ltd., 1 New Oxford St, W.C.1, produce such a set for use with their shavers. The necessary range of adaptors are also made by George Turnock Ltd., Tunion Works, Navigation St, Walsall.

22 June—South Africa. Stores Dept. of S. African Railways, Johannesburg, invite tenders (No. C.39) for supply of various cable installation test equipment. B.o.T. (Ref.: ESB 11116/55).*

23 June—New Zealand. Supply of 10,000 24 V switchboard lamps and 25,500 6 V ditto. Ref.: P and T 150/7923. Director-General, Stores Div, G.P.O., Wellington. B.o.T. (Ref.: ESB 10601/55).*

24 June—India. Outdoor and indoor switchgear and other equipments for eleven 33/11 kV substations, in Mettur interconnection scheme. Specif. E.261. Superintending Engineer, Technical (Electrical), 157 Mount St, Madras. B.o.T. (Ref.: ESB 11194/55).*

5 July—New Zealand. Director-General, Stores Div, G.P.O. require combined vacuum cleaner-floor polisher, operating from 230 V 50 c.p.s. and incorp. scrubbing, suction squeegeeing, floor polishing and vacuum cleaning. B.o.T. (Ref.: ESB 10600/55).*

7 July — Australia. Three turbine auxiliaries starting boards for operation in 440 V 3-phase 50 c/s system at Bunbury power station. Spec. No. 22/BUN. State Electricity Commission of Western Australia, Perth. B.o.T. (Ref.: ESB 10867/55).*

26 July—Iraq. Directorate General of Municipalities, Baghdad, require three 50 kW alternators and sets with switchboard for Qalat Saleh power station, Amara Liwa. B.o.T. (Ref.: ESB 10066/55).*

26 July—Kuwait. Govt's Dept. of Electricity requires supply of various types of lighting fittings. B.o.T. (Ref.: ESB 10514/55).*

28 July—Australia. Main high voltage switchgear for Western Australian Govt. Railway Workshops, Midland Junction. Govt. Tender Board, 74 Murray St, Perth. B.o.T. (Ref.: ESB 10881/55).*

2 Aug.—Iraq. One 100 kW and one 50 kW generating set d.c. at Souk-El-Shiyoukh, Muntafik Liwa, required by Directorate General of Municipalities, Baghdad. B.o.T. (Ref.: ESB 10034/55).*

2 Aug.—Kuwait. Separate tenders invited for (*a*) electrical installation materials, including bakelite lampholders, ceiling roses, switches, wiring clips, insulation tape, etc.; and (*b*) electrical reflectors and floodlights. Govt's Dept. of Electricity. B.o.T. (Ref.: ESB 10316/55, and 10517/55).*

9 Aug.—Iraq. Supply and erection of generating plant of capacity of 350 kW comprising one 250 kW and one 100 kW d.c. diesel electric generating sets, two 600 kVA transformers and associated h.v. and l.v. control switchgear, h.v. terminal boxes, fuel oil storage tanks, overhead operated travelling crane. Equipment required for Falluja. Directorate General of Municipalities, Baghdad. B.o.T. (Ref.: ESB 10628/55).*

9 Aug.—Kuwait. Supply of total of 40,000 yd of P.B.J. insulated hard drawn copper cable for Dept. of Electricity, Govt. of Kuwait. Tender No. DE/22/2/38. B.o.T. (Ref.: ESB 10518/55).*

10 Oct.—Australia. Supply, erection, etc., of nine electrically driven level luffing, portal, jib cranes for Port Kembla Harbour, to contract No. 93–54/55 H. and R. Documents from Agent-General for N.S.W., 56–57 Strand, London, W.C.2, quoting ref.: F8028 ESC.

No date stated—Iraq. Supply and installation of two diesel engines with pumps and a.c. generators for Rest Hse at Zawita. Govt. of Iraq's Development Board, Baghdad. B.o.T. (Ref.: ESB 9960/55).*

No date stated—Uganda. Installation of electric lighting and power in Govt. buildings at Masaka (contract 279) and at Soroti (contract 280). Apply in both cases to Director of Public Works, P.O. Box 10, Entebbe. B.o.T. (Ref.: ESB 10789/55).*

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 31 May

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	334	−1	240½
„ (3 months)	322	+5½	238½
R.S.T. (Rhodesian Selection Trust) group price*	280	—	—
LEAD, refined pig, min. 99·97% purity (cash)	91½	−12½	98½
„ (3 months)	89½	−13½	96½
TIN, refined, min. 99·75% purity (settlement)	720	+6	725
„ (3 months)	720	+3	723
ALUMINIUM, ingots 99·99·5%	163	—	156
ZINC, virgin, min. 98% purity (cash)	103½	+13	81½
„ (3 months)	102½	+13½	81½
RUBBER No. 1, RSS. spot (per lb.)	27½d.	—	18½d.
„ c.i.f. basis, ports, Aug. (per lb.)	26½d.	—	18½d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52½	—	51
Mild Steel Tape (0·014 in.)	41½	—	40

(*Fixed price c.i.f., U.K. for 30 days from 9 May to "consumers willing to instil a degree of stability into the resale price".)

Contracts Placed

Cardiff T.C. Installation at Clare Rd, depot, Page and Stibbs Ltd., £4,330.

Croydon. Rewiring of Administration block at Mayday Hospital, W. Steward, Ltd., £11,898.

Derby T.C. Installation in 89 houses in Harvey Rd scheme, H. I. Petts Ltd., £2,040.

Larne T.C. Installation of a street lighting scheme on Cairncastle Rd estate, N. Ireland Electricity Board, £2,822.

Leek (Staffs) U.D.C. Street lighting columns and lanterns in Broad and Brook Sts, Staffordshire Constructional Co., £1,013.

Manchester T.C. Installation at Broadoak primary school, L. A. Veale and C. R. Whateley (sub-contractors); same in 18 dwellings on Langley estate, and 68 in Ridgway St, F. W. Cole and Sons Ltd.

Middlesex. Improvement of lighting at Enfield, Chase Side schools, Iverson Electrical Ltd., £1,193.

St. Monance (Fife) T.C. Extension of street lighting system, General Electric Co., £1,616.

Warrington T.C. Installation in 8 houses and shops on Orford estate, Braithwaite and Leslie Ltd. (sub-contractors); same in about 180 houses on Orford estate, Charters Electrical Co., Ltd. (also sub-contractors).

West Hartlepool T.C. Year's supply of electrical accessories for housing schemes, T. J. Grainger Ltd.

Witney (Oxon) U.D.C. Supply and erection of group A street lighting along about a mile of trunk road, Revo Electric Co., Ltd., £4,615.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Elcom. 736,503. Class 9. Resistances, volume controls, suppressors, potentiometers, etc. Electronic Components Ltd., Weedon Rd Industrial Estate, St. James', Northampton.

Speechmaster. B738,461. Class 9. Sound recording and reproducing apparatus. H. W. S. Grist, Howard Hse, Dolphin Sq, S.W.1.

Phonovisor. 739,712. Class 9. Television transmitting and reproducing apparatus, etc. Hartley Baird Ltd., 37/39 Thurloe St, S.W.7.

Igranite. 740,187. All goods Class 17. Igranic Electric Co., Ltd., Elstow Rd, Bedford.

Peconomic. 731,171 Class 7. Conveyors, elevators, screening machines, etc. Porter Eng. Co., Ltd., 32/36 Denton St, Carlisle, Cumberland.

Micropac. B736,905. Class 7. Units consisting of generator and an internal combustion engine. Microsol Industries Ltd., 16 Southampton Row, W.C.1

Ever Ready. 737,788. Class 7. Electric motors for toys. Ever Ready Co. (Gt. Britain) Ltd., Hercules Place, Holloway, N.7.

Tridaulic. 740,167. Class 7. Sawing machines. Midland Saw and Tool Co., Ltd., "Midsaw" Works, Pope St, Birmingham 1.

Sonixbox. 737,987. Class 9. Wireless, telephonic, television and telegraphic instruments, etc. Armstrong Wireless and Television Co., Ltd., 25/27 Oxford St, W.1.

Minivox. 739,834. Class 9. Combined loud speakers and microphones. Modern Automatic Telephones Ltd., Telesound House, 101 Tottenham Court Rd, W.1.

Hoover. B739,425. Class 28. Toy washing machines. Hoover Ltd., Perivale, Greenford, Middlesex.

Trade Notes

New Depot. The Scottish Service Depot of E. K. Cole Ltd. has been transferred to new premises at 17 Cadogan St, Glasgow, C.2. Telephone: Glasgow Central 3633.

Change of Address. Donvin Instruments Ltd. have moved to Electrin Works, Winchester St, Acton, W.3. Telephone Acorn 4995.

BUSINESS PROSPECTS

Home

Accrington. Provisional plans approved for C.E. secondary modern school at Moorhead. W. Houston, short surveyor, 30 Burnley Rd, Padiham.

Banstead (Sur). Revised scheme approved for county secondary modern school at North Tadworth Farm. Estimated cost £193,420.

Barnsley. Amended proposals approved for second instalment of extensions to Mining and Technical College estimated to cost £164,686.

Birmingham. Bulpitt and Sons Ltd. are to erect industrial premises, offices, etc., on corner of Dudley and Western Rds.

Also, the Y.W.C.A. to erect new centre off Bristol Rd at cost of about £75,000. It will comprise flatlets, canteen, hall, shops, etc.

Brecon. Ministry approval received for construction of new council chamber.

Brighouse. Factory to be built on Wakefield Rd industrial estate for lease to W. and A. Thompson Ltd.

Bristol. Erection of primary school at Heggard Close, Withywood. City Architect, Council House, College Green.

Also, A. F. French and Partners, Halifax Hse, St. Augustine's Parade, are architects for industrial premises proposed by A. Scull and Son Ltd.

Brodsworth (Yorks). Aged persons' hostel to be built off Barnsley Rd at cost of about £38,320.

Cardiff. Lancing Bagnall Ltd., 14 St. Cadoc Rd, want to acquire land on Newport Rd industrial estate.

Chingford T.C. Erection of 36 flats in six blocks on Hatch Lane site. Borough Engineer, Town Hall, E.4.

Consett. Old Globe Theatre is to be converted into ballroom by Vaux and Assoc. Breweries Ltd. Architect is E. M. Lawson, Barras Buildings, Barras Bridge, Newcastle.

Crawley. W. J. Saville and Co., Ltd., propose to erect factory at new town at cost of about £70,000. Plans by A. J. Herbert and Partners, 119 Victoria St, S.W.1.

Cray Valley (Kent). Additional accommodation to be erected at Technical School for Boys. Estimated cost, £32,000.

Dartford. Welding and engineering works to be built in Burnham Rd, by Martin Welding and Cutting Co., Ltd.

Derbyshire. Hope Valley secondary modern school, estimated to cost £103,152, has been included in 1955–56 programme.

Epping U.D.C. Construction of 28 houses and 12 bungalows at Coronation Hill. Surveyor, 91 High St.

Eston (Yorks). Winterschladen and Co., Ltd., Middlesbrough, propose to build modern bottling factory at South Bank.

Fareham (Hants). Plans approved for erection of factory on Railway Hotel site for Leethems (Twilfit) Ltd., Rodney Rd, Milton, Portsmouth. Revised sketch plans prepared for Fareham Pk junior school.

Gateshead. Clinic to be provided at Queen Elizabeth Hospital. Chief architect to Newcastle Hospital Board is P. H. Knighton.

Great Yarmouth. Tramway Hotel to be rebuilt for Diver and Son Ltd., King St. Olley and Haward, Queen St, are architects.

Grimsby T.C. Scheme in hand for new central library, art gallery and hall.

Halesowen. Wireguards Ltd. propose extensions to factory at Cradley.

Highworth (Wilts) R.D.C. Tenders may soon be invited for erection of 8 bungalows at Wroughton, and 35 flats at Upper Stratton. Plans being prepared for 136 houses at Stratton St. Margaret.

Hornchurch. Tiptools Ltd., are planning to erect a factory at Rainham.

Houghton-le-Spring U.D.C. Ministry approval sought for erection of 100 houses at Shiney Row.

Hounslow. It is proposed to erect junior school near Springwell Rd. Cost estimated at £56,485.

Inverness. Dean of Guild Court has approved motor car showroom in Tomnahurich St for Rossleigh Ltd., of Union St, Aberdeen.

Kirkcaldy. Factory at Smeaton Field, Hayfield Rd, to be built by M. Nairn and Co., Ltd., of Victoria Rd.

Lanark. Dean of Guild Court has approved plans for primary school. Cost estimated at £87,000.

Liverpool. Mersey Mission to Seamen propose to build central club and headquarters in James St. Architects are Willink and Dod, Cunard Building.

London. Metropolitan Press Ltd. to erect premises in Goodman St, E.1. Plans by Corry and Corry, 264 Kensington High St, W.12.

Also, Extensions in Brewery Rd, N.7, by A. Courts and Co., Ltd., are estimated to cost £40,000, and architect is R. Tubbs, 35 Welbeck St, W.1. Also, Douglas Gas Meters Ltd. propose to build factory in Colville Rd, W.3, to plans by H. Butcher and Co., 73 Chancery Lane, W.C.2.

Longbenton (Northumb). George Angus and Co., Ltd., of Newcastle, are planning to erect factory in Benton Sq.

Maidstone. Scheme proposed to rewire electrical installations in old building of Technical College. Estimated cost, £2,900.

Also, Works extension and offices at Tovil Printing Works are planned by Alabaster Passmore and Sons Ltd. Architects are Wallis Gilbert and Partners, 5 Cromwell Rd, London, S.W.7.

Manchester. Three-storey works and offices at Cawdor Hse, Hulme, proposed by Phoenix Engraving Co., Ltd. Plans by Price Nunn and Quysner, 180 Oxford Rd.

Middlesbrough. Warehouse, offices and showrooms being planned by both R. Johnson, Clapham and Morrison Ltd., of Zetland Place, and Middleton and Co., Ltd., of Boundary Rd. Architects are F. E. Cross and Partners, 20 Booth St, Manchester, and Garbutt, Archibald and Archibald, 23 Albert Rd, Middlesbrough, resp.

Mitcham. James Ferguson and Sons Ltd. to erect laboratory and alter offices at their Lea Pk Works, Prince George's Rd, S.W.19. Architects are Hastie, Winch and Kelly, 1 Bentinck St, London, W.1.

Monmouth T.C. to build £40,000 factory for Scotts Engineering (Newport) Ltd.

Monmouthshire. Construction of new biology lab. at Bassaleg grammar school. C. L. Jones, County Architect, Queen's Hill, Newport.

Newcastle-on-Tyne. W. Barratt and Co., Ltd., to rebuild their footwear stores. Architects are Marshall and Tweedy, 36 Blackett St.

Also, Erection of 44 dwellings on Slatyford Lane estate and 24 at Byker Bank. City Architect, 18 Cloth Market.

Plymouth T.C. It is proposed to erect 96 flats off Cecil St. The Admiralty are to build 152 houses and 126 flats in Barne Rd, and 180 houses and 270 flats in Kit Hill Cresc, St. Budeaux.

Port Glasgow (Renfrew) T.C. £160,000 to be spent on conversion of tenement property at Bouverie into modern homes.

Queensbury and Shelf (Yorks) U.D.C. Erection of 18 houses on Cockhill estate. Engineer and Surveyor, Council Offices, Queensbury.

St. Austell U.D.C. Erection of 28 houses at St Austell and Par. H. G. King, Engineer and Surveyor, Municipal Offices.

St. Mary Cray (Kent). Laboratories costing about £30,000 proposed by Burmah Oil Co., Ltd. Quantity Surveyors are Yeoman and Edwards, 28 Wigmore St, London, W.1.

South Shields T.C. Construction of 39 houses in Jesmond Terr, Simonside, and 95 on Simonside estate. Borough Engineer, J. Reid, Town Hall.

Spalding (Lincs) R.D.C. It is proposed to erect 32 houses and 8 bungalows in Brownlow Cresc, Pinchbeck.

Sutherland. It is proposed to erect junior secondary school for Clyne parish, and a hostel for Golspie senior secondary school. Estimated costs £120,000 and £70,000.

Sutton Coldfield. Plans have been submitted for factory on Reddicap Hill estate for S. and E. Repetition Ltd., 170a Hampton St, Birmingham.

Tiverton (Dev) T.C. Thirty-nine houses to be built on Wilcombe estate, as well as 5 houses at Westexe South, 4 at Whitleigh and 2 in Westexe Recreation Rd

Torquay. New factory to be built in Newton Rd, for Gravely Overseas Ltd., Dart Mills, Buckfastleigh.

West Hartlepool T.C. Health centre costing about £150,000 is to be included in future building programme.

West Riding. Kitchen for new secondary school at Bently is estimated to cost £5,200.

Wisbech. It is now proposed to erect whole of new Queen's Boys' School at Worlds End in place of original plan for first instalment.

Woolwich B.C. Sketch plans approved for erection of 47 flats on Coldharbour estate.

Worcester. Five-storey office block to be built off St. Oswald's Rd at cost of about £80,000.

York. Queen Anne grammar school to receive grant of £90,000 for extensions.

Overseas

Colombia. Agency, on commission basis, for U.K. manufacturer of conduit junction boxes, sought by Senor Luis Ernesto Arias Luna, Avenida Jimluez No. 8-60, Bogota.

Malaya. Sim Ah Kow and Co., 24 Bonham Building, P.O. Box 516, Singapore, would like to represent U.K. manufacturers of electric domestic appliances, such as toasters, kettles, etc., fluorescent fittings and condensers, TRS cables 3/·029, etc.

Saudi Arabia. Abdulaziz al Ahmad and Mahomed Jumaih, Riyadh, would like to contact U.K. suppliers of 10-17 h.p. deep well slow-running diesel driven vertical pumping sets and small 3 or 4 kW generator sets.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Jabroc Ltd., Mill Lane, Croydon, Surrey. Purchase and sale, and the transport of hardwoods, softwoods and woods capable of being rendered flexible; to prepare them for electrical, chemical, mechanical, heating or sounding purposes or to render them impervious to sound, etc. Nom. cap.: £20,000. Dirs.: B. Jablonsky, J. H. Collins, Rt. Hon. Baron Selsdon and H. Howarth.

Keylutor Co., Ltd. Manufacturers of and dealers in engineering products, radio and electrical goods, rubber goods, etc. Nom. cap.: £500. Dirs.: J. R. Keys and Florence M. Keys, 43 Forest Lane, Chigwell, Essex.

Hasler Telegraph Works Ltd., 26 Victoria St, S.W.1. To take over business of importers and exporters carried on at 26 Victoria St, S.W.1, as "Hasler Telegraph Works"; exporters and importers of and dealers in goods of all kinds, and in particular appliances used in connection with telegraphy, etc. Nom. cap.: £10,000. Dirs.: not named. Subs.: J. C. Gubbins, 18 Bolton St, W.1; and Joan M. Vine, 221 Walton Rd, East Molesey, Surrey.

Radvan Electronics Ltd. 129 Portobello Rd, W.11. Nom. cap.: £1,000. Dir.: W. J. Radwan-Kuzelewski.

Ridge Electrical Agencies Ltd. 3 Abchurch Yard, E.C.4. Nom. cap.: £500. Dirs.: N. C. Ridge and Herta M. C. Ridge.

O. E. Longshaw and Co. (Engineers) Ltd. 89 Bellenden Rd, Peckham, S.E.15. Heating and ventilating engineers, etc. Nom. cap.: £100. Dirs.: O. E. Longshaw, and P. Partridge.

Sir Howard Grubb Parsons and Co., Ltd. The Optical Works, Walkergate, Newcastle-on-Tyne. To take over business of manufacturers of telescopes and optical instruments and equipment, and optical, electrical and mechanical precision engineers carried on at Walkergate, Newcastle-on-Tyne, by C. A. Parsons and Co., Ltd., as Sir Howard Grubb Parsons and Co. Nom. cap.: £500,000.

Gazette Announcements

COMPANIES ACTS

Refrigeration (Plymouth) Ltd. Date of winding-up order, 19 May. Petition presented on 18 Apr.

Reproducers (Electronic) Ltd. Petition for winding-up presented on 20 May, and directed to be heard at Royal Courts of Justice, London, on 13 June. Interested persons should contact Sidney Pearlman, 2 Stone Buildings, Lincoln's Inn, W.C.2, by 11 June.

A. T. Snowden Ltd. Resolution for voluntary winding-up passed at meeting on 20 May, when L. Larholt, Cunningham Hse, Cunningham Hill Rd, St. Albans, was appointed liquidator.

Elexcel Ltd. Meeting will be held at Strowger Hse, Arundel St, London, W.C.2, on 29 June at 11 a.m. to receive liquidators' report.

BANKRUPTCY ACTS

Intended Dividends

Bolton. Herbert S. Page, electrical retailer, of 109 Market St, Westhoughton. Last day for receiving proofs, 7 June. Trustee is A. T. Eaves, 47 Mosley St, Manchester.

Dirs.: Sir Claude D. Gibb, G. M. Sisson, and D. P. Walton.

Inductive Controls Ltd. To acquire letters patent, inventions, etc. Nom. cap.: £1,000. Dirs.: not named. Subs.: W. Brooks, Oakfield, 13 Carlton Rd, Hale, Altrincham; and H. Howe, Three Ways, Chapel Lane, Hale Barns, Ches.

John Tanner Ltd., 9 Green St, Warrington. Wireless, television, telephonic and telegraphic engineers, etc. Nom. cap.: £10,000. Dirs.: J. A. Tanner and Irene A. Tanner.

Wessex Recording Service Ltd., 6 Hanover Sq, W.1. Manufacturers of and dealers in recording apparatus, etc. Nom. cap.: £100. Dir.: R. Simmonds.

Brompton Broilers Ltd., 9 Ironmonger Lane, E.C.2. Electricians, mechanical engineers, etc. Nom. cap.: £100. Dirs.: not named. Subs.: B. Sandleson, 9 Ironmonger Lane, E.C.2; and W. A. Ewans, 8 Highfield Ave, N.W.11.

Roberts and Eaton Ltd., 18 High St, Alfreton, Derbyshire. To acquire certain assets of Sydney Roberts and John R. Eaton, trading as Roberts and Eaton, Alfreton, as radio and television engineers and retailers, retailers of domestic equipment, etc. Nom. cap.: £10,000. Dirs.: S. Roberts, and J. R. Eaton.

Blagdon-Durham Ltd. Framwellgate Leather Works, Durham City. Electrical, mechanical, agricultural, marine, mining, constructional and general engineers, etc. Nom. cap.: £100. Dirs.: G. Blagdon, and G. Flynn.

Skinners Cold Storage Ltd., 24 Basinghall St, E.C.2. Nom. cap.: £100. Dirs.: A. S. Stalbow, and S. N. H. Gabe.

G. Hammond (Sales) Ltd., 79/81 Wigmore St, W.1. Distributors, concessionaires and agents for the sale of and manufacturers of and dealers in cutlery, tools and electrical equipment of all kinds, etc. Nom. cap.: £1,000. Dirs.: G. Hammond, and Iris D. Parsons.

Hartons Installations (Sales) Ltd., Bagshot St, Southwark, S.E.17. Electrical and general engineers and contractors, etc. Nom. cap.: £100. Dirs.: A. J. Matthews, F. W. S. Horn, and E. M. Noyes.

R. T. C. Wright and Co., Ltd., 43 College Rd, Perry Barr, Birmingham. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Nom. cap.: £2,000. Dirs. R. T. C. Wright and Mrs. L. B. Wright, Mrs. A. E. Wright, Mrs A. Weatherhead and R. A. Flamank.

Cooper Productions (Ross) Ltd. General, precision, mechanical, motor and electrical engineers, etc. Nom. cap.: £5,000. Dirs.: S. F. Cooper, 67 Sandhurst Ave, Birmingham 34; and C. G. O'Donnell, Tudor Hse, Westmancote, Bredon.

Battenberg Electrical Ltd., 1040 Brackenbury Rd, W.6. Manufacturers of and dealers in electrical appliances and apparatus, etc. Nom. cap.: £2,500. Dirs.: T. N. Battenberg, W. A. Battenberg, and G. S. Parsons.

Rodley Electrical Distributors Ltd. Nom. cap.: £1,000. Subs.: G. A. Procter, 14 Waterloo Rd, Pudsey, Leeds; and P. L. Quin, 2 Peel Terr, Bradford.

H. W. Gilbert Ltd, Rear of 69 and 71 High St, Brentwood. Wholesalers and general trade suppliers and providers of all kinds of radio, television, electric and electronic apparatus, etc. Nom. cap.: £5,000. Dirs.: H. W. Gilbert, and H. A. Merchant.

Lambert Precision Ltd. 21-23 St. Pauls Sq, Birmingham. Mechanical, electric, hydraulic, automobile, aeronautical, marine, precision and general engineers, etc. Nom. cap.: £5,000. Dirs.: E. E. Lambert and Mrs S. M. Lambert.

G. H. Beamish and Co., Ltd. 568 Foleshill Rd, Coventry. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Nom. cap.: £1,000. Dirs.: Ivy M. Beamish and G. E. H. Beamish, W. Tisdale and R. A. D. Bond.

W. A. Cowie (Electrical) Co., Ltd. 1 Henry St, Warrington. Manufacturers of and dealers in general electric goods, etc. Nom. cap.: £5,000. Dirs.: W. A. Cowie and Mrs J. Cowie

Public Company

Nuclear Power Plant Co., Ltd. To design, manufacture, construct, acquire, develop, maintain, repair, operate and dispose of nuclear power plants and works of all kinds, and any future development of them, etc. Nom. cap.: £1,000,000. Dirs.: Sir Claude D. Gibb, A. T. Bowden, and H. H. Mullens.

MEETINGS TO NOTE

THURSDAY, 2 JUNE

A.S.E.E. (S. London). Annual meeting at Cafe Royal, Croydon, 7.15 p.m.

FRIDAY, 3 JUNE

A.S.E.E. (Bristol). Annual meeting at Grand Hotel, 7.30 p.m.

A.S.E.E. (Liverpool). Annual meeting at Liverpool Engrng. Soc., 9 The Temple, 24 Dale St, 6.30 p.m.

A.S.E.E. (N.W. London). Annual meeting at Century Hotel, Wembley Park, 7.30 p.m.

MONDAY, 6 JUNE

E.C.A. Annual conference opens at Margate.

I.E.E (Western). Annual meeting at Electricity Hse, Colston Ave, Bristol, 6 p.m.

A.S.E.E. (Bolton). Annual meeting at Balmoral Hotel, Bradshawgate, 7.30 p.m.

A.S.E.E. (Leeds). Annual meeting at Great Northern Hotel, 7 p.m.

A.S.E.E. (N.E. London). Annual meeting at Angel Hotel, Ilford, 6 p.m.

TUESDAY, 7 JUNE

I.E.E. (London). Summer visit to N. of Scotland lasting until 11 June.

A.S.E.E. (W. London). Annual meeting at Windsor Castle Hotel, King St, Hammersmith, 7 p.m.

A.S.E.E. (S. Wales). Annual meeting at Angel Hotel, Westgate St, Cardiff, 7 p.m.

A.S.E.E. (S.E. London). Annual meeting at Congregational Church Hall, Eltham, 7.15 p.m.

A.S.E.E. (Portsmouth). Meeting at The Air Balloon, Commercial Rd, Mile End, 7.30 p.m.

N.A.L.G.O. Annual conference opens at The Dome, Brighton, continuing until 10 June.

WEDNESDAY, 8 JUNE

A.S.E.E. (Birmingham). Annual meeting at Chamber of Commerce, New St, 6.30 p.m.

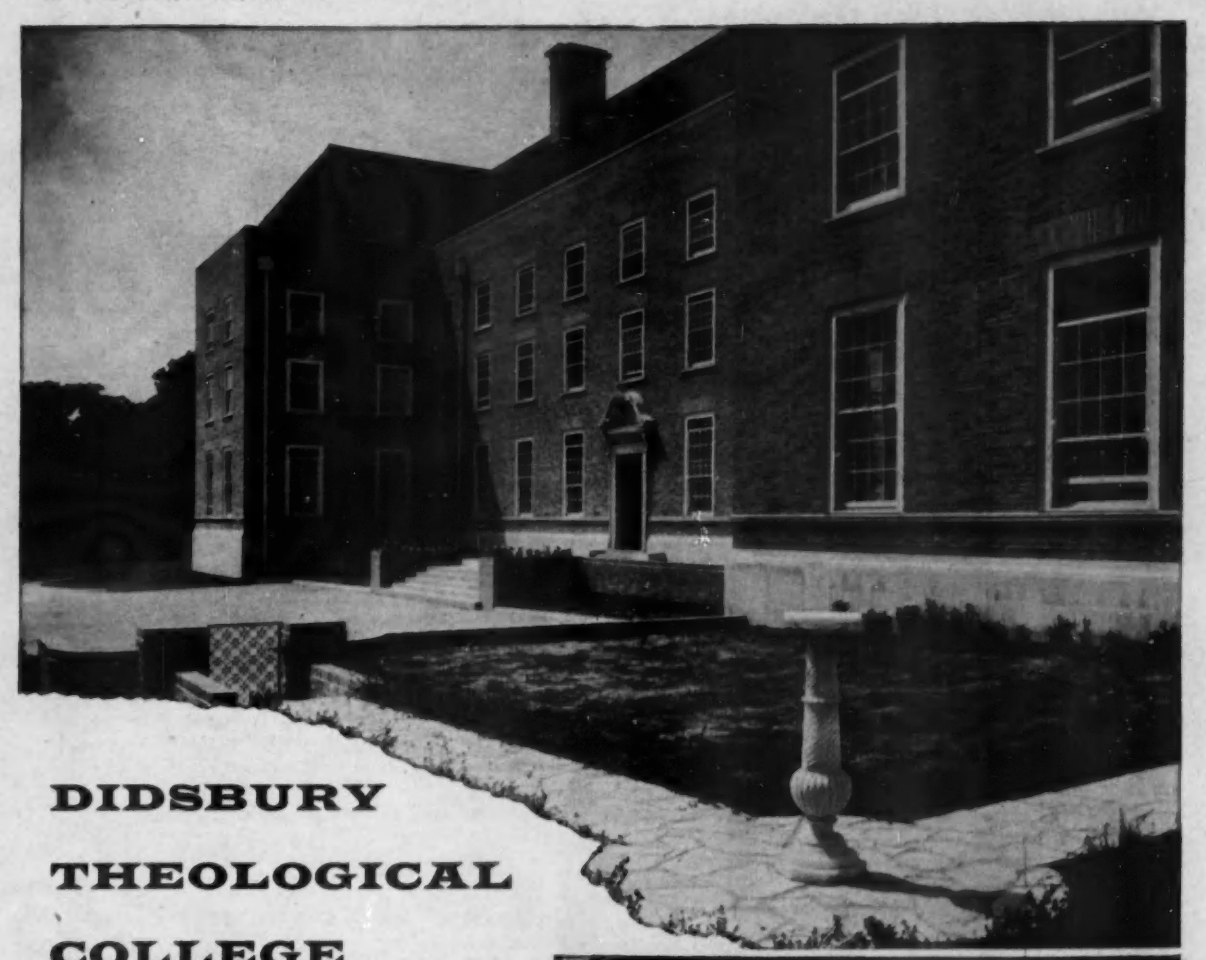
A.S.E.E. (Bradford). Annual meeting at Midland Hotel, 7 p.m.

A.S.E.E. (Nottingham). Annual meeting at Elect. Showrooms, Smithy Row, 7.30 p.m.

A.S.E.E. (York). Annual meeting at Picture House Cafe, Coney St, 7.15 p.m.

SATURDAY, 11 JUNE

A.S.E.E. (Oxford). Annual meeting at Y.M.C.A., George St, 6 p.m.



DIDSBURY THEOLOGICAL COLLEGE

WESTBURY-ON-TRYM, BRISTOL

The new Didsbury Theological College derives its name from Didsbury in Manchester, its original location. Now at Bristol, a city of strong Methodist traditions, Didsbury, the oldest Theological college, is an impressive and well-designed modern building.

Designed by Sir Percy Thomas & Son, the college has 64 bedrooms, a large common room, dining and kitchen accommodation. The electrical installation was carried out by **Messrs. Buchanan & Curwen Ltd.**, and consists of approximately 400 lighting and heating points, fire alarms and bell circuits.

WIRED THROUGHOUT WITH HENLEY CABLES

W. T. HENLEY'S TELEGRAPH WORKS COMPANY LIMITED. 51-53 HATTON GARDEN. LONDON. E.C.1

HERE IS PHILIPS "Gear-less" LIGHTING

(NO CHOKE, P.F. CAPACITOR OR STARTER SWITCH)

And here are some of the reasons why it's so popular

- Lowest priced fluorescent lighting
- Fluorescent lamp and filament lamp can be fixed separately or together, as desired.
- Absolutely noiseless in operation
- Very light weight
- No control gear or starter switch required
- With Deluxe Warm White lamp gives perfect colour rendering for the display of food
- Light equal to two 100 watt filament lamps for only 115 watts

Because all heavy control gear is replaced by a single tungsten ballast lamp Philips "Gear-less" lighting is extremely light in weight. And this saving reduces the cost to an amazingly low level. Whatever the specification, Philips "Gear-less" fluorescent lighting undoubtedly offers the finest value on the market today!

"Gear-less" FLUORESCENT LIGHTING from PHILIPS

PHILIPS ELECTRICAL LIMITED
Lighting Division, Century House, Shaftesbury Avenue, London, W.C.2

TUNGSTEN, FLUORESCENT, BLENDED AND DISCHARGE LAMPS
LIGHTING EQUIPMENT · PHOTOFLUX FLASHBULBS, ETC.

(LD787)

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

COUNTY BOROUGH OF SWANSEA

MYNYDDBACH COUNTY SECONDARY SCHOOL FOR GIRLS, SWANSEA

TENDERS FOR ELECTRICAL INSTALLATION

FIRMS wishing to Tender for the Electrical Installation at the Mynyddbach County Secondary School to be erected at Tirdeunaw, Swansea, are invited to submit their applications to the Borough Architect, The Guildhall, Swansea, on or before 15 June, 1955.

Plans, Specification and Conditions of Contract can be obtained on application and deposit of £2, provided the applicant gives satisfactory evidence of having previously carried out work of a similar character.

The deposit will be refunded after delivery of a bona fide tender (which is not subsequently withdrawn) and the return of all documents.

No guarantee is given that the lowest or any other Tender will be accepted.

T. B. BOWEN,
Town Clerk.

The Guildhall,
Swansea,
16 May, 1955. (T 39)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

CENTRAL ELECTRICITY AUTHORITY
South Eastern Division

SHIFT CHARGE ENGINEER—Brighton "B" Power Station. Applicants should preferably possess Higher National Certificate or equivalent qualification and must have had extensive experience in the operation of modern high pressure turbine and boiler plant, E.H.T. switchgear and in the control of labour. P.F. experience an advantage. Class J, Grade 7, £900/£975 per annum.

THIRD ASSISTANT ENGINEER in the Technical Department based at Croydon. Applicants should possess H.N.C. in Electrical Engineering or equivalent qualification. Experience essential in the installation and maintenance of all types of automatic protective gear and in commissioning tests on alternators, transformers and switchgear. Class AX/DX Grade 4, £750/£875—£950 per annum, plus 5% London Allowance.

Applications for both positions giving details of education, present position, experience, etc., should be sent to either the Station Superintendent, Brighton Power Station, Portslade-by-Sea, Sussex, or Establishments Officer, Central Electricity Hse, Lower Ham Rd, Kingston-on-Thames, according to the location of the vacancy, to arrive by 11 June. (T 51)

NOTTINGHAMSHIRE COUNTY COUNCIL EDUCATION COMMITTEE
West Nottinghamshire Divisional Executive

MANSFIELD TECHNICAL COLLEGE

Principal, R. F. Beaton, B.SC.(ENG.), WH. SCH.

APPLICATIONS are invited for the post of ASSISTANT GRADE "B" in Electrical Engineering subjects to teach to the level of the Higher National Certificate. Applicants should hold suitable qualifications and adequate industrial experience, preferably in Mining or an associated industry, is expected. Some experience in teaching will be an advantage.

Salary will be in accordance with the Burnham Technical Scale for Assistants, Grade B, £525 by £25 to £820 per annum. Additions may be made for certain qualifications and study training. The position on the scale is determined by previous teaching and industrial experience.

Forms of application may be obtained from (s.a.e.) and should be returned to, the Divisional Education Officer, Market Place, Mansfield, within two weeks of the appearance of this advertisement.

J. EDWARD MASON,
Director of Education.
(T 47)

COLLEGE OF TECHNOLOGY, BIRMINGHAM
Department of Electrical Engineering

APPLICATIONS are invited for the post of RESEARCH ASSISTANT in the Department of Electrical Engineering. Candidates must have a good honours degree in Electrical Engineering, and preferably should be graduates of a University which awards higher degrees for external study.

Salary will be in accordance with the Burnham (Further Education) Scale for Grade A Assistants. Basic salary (Men) £510 with increments for approved training and industrial or teaching experience.

Further particulars and form of application may be obtained from the Registrar, College of Technology, Suffolk St, Birmingham, 1, on receipt of stamped-addressed foolscap envelope. Completed forms should be returned to him not later than two weeks after the insertion of the advertisement.

K. R. PILLING,
Clerk to the Governing Body.
(T 41)

SOUTH EASTERN ELECTRICITY BOARD

SENIOR SHOWROOM ASSISTANT

Lewes District

SALARY within the range £425 x £20—£525 under N.J.C. Grade 1, according to experience. Superannuable. Applicants should have had experience of showroom sales and service work, including control of stock. The successful applicant may be required to work at any of the district showrooms at Seaford, Newhaven, Peacehaven or Lewes.

Applications, naming 2 referees, on forms from G. R. Lincoln, ASSOC.I.E.E., District Manager, SEEBoard, 80/81 High St, Lewes, Sussex, by 15 June, 1955.

A. L. BURNELL,
Secretary.
(T 79)

HER MAJESTY'S OVERSEA CIVIL SERVICE

TWO VACANCIES EXIST FOR ELECTRICAL ENGINEERS IN THE PUBLIC WORKS DEPARTMENT, HONG KONG

DUTIES are for Post A, planning, estimating and erection of complete electrical installations in large buildings, hospitals, etc., including H.T. and L.T. switch boards, transformers, lifts, pumps, electro-medical apparatus, etc., and for Post B, the specification and supervision of installation and maintenance of all electrical equipment operated by the Hong Kong Government including motors, emergency generators, H.T. and L.T. switchgear, transformers, cabling, lifts, electro-medical apparatus, domestic appliances, etc.

Appointments are pensionable in the salary range £1,256/£2,179. A varying C.O.L.A. is also payable. Government quarters are provided at low rentals. Free passages are provided for the officer, his wife and children up to a total cost of five adult passages. Leave is granted at the rate of 1 day for every 7 days' resident service.

Candidates under 35 years of age, should be A.M.I.E.E. or have passed, or be exempt from Sections A and B of the examination for A.M.I.E.E. and have at least 2 years' practical experience of electrical engineering work. Experience in the installation of heating and ventilating plant would be an advantage.

Apply in writing to the Director of Recruitment, Colonial Office, Gt. Smith St, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number (BCD.112/51/012/D10).
(T 68)

CENTRAL ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the position of FOURTH ASSISTANT ENGINEER, Telecommunications, based at the Regional Technical Office, Leicester.

Applicants should be thoroughly familiar with automatic telephone type equipment and circuitry and should have experience of V.F. signalling. A knowledge of carrier communications and power system supervisory equipment would be advantageous.

Candidates should have a good general education and be in possession of suitable technical qualifications.

Salary will be in accordance with Class AX/DX, Grade 6 (£600/£785 per annum) of the National Joint Board Agreement and the position will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by 16 June, 1955. Please quote Vacancy Number 86/55/ET.

L. F. JEFFREY,
Divisional Controller.
24 May, 1955. (T 42)

AUSTRALIA—UNIVERSITY OF SYDNEY

APPLICATIONS are invited for the position of LECTURER IN ELECTRICAL ENGINEERING. Applicants should have had experience in the field of interconnected power systems.

The salary for a Lecturer is within the range of £A1,200/£A1,750 per annum, with annual increments of £A80. The salary is subject to deductions under the State Superannuation Act. The commencing salary will be fixed according to the qualifications and experience of the successful applicant.

Finance available for home purchase under Staff Members' Housing Scheme.

Further particulars and information as to the method of application may be obtained from the Secretary, Association of Universities of the British Commonwealth, 36 Gordon Square, London, W.C.1.

The closing date for the receipt of applications, in Australia and London, is 30 June, 1955. (T 50)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments, which are superannuable and subject to medical examination, in the Board's No. 4 Sub-Area.

ASSISTANT SECTION ENGINEER (Operation) required in the Board's Clwyd District based on Rhuddlan.

ASSISTANT SECTION ENGINEER required in the Caernarvon District based on Ffestiniog.

Salaries: £635/£680 per annum (N.J.B. E/9).

Applicants should have had experience of H.V. and M.V. overhead and underground distribution work.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity Hse, Rhostyllen, near Wrexham.

Closing date: 13 June, 1955. (T 44)

NORTH WESTERN ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN, CONSTRUCTION ENGINEER'S SECTION, CHIEF ENGINEER'S DEPARTMENT, AREA BOARD HEADQUARTERS, MANCHESTER

APPLICANTS should have had a good technical training and Drawing Office experience in the electrical design, layout and detailing of indoor and outdoor substations up to and including 33,000 V, together with the preparation of protection system schematic and wiring diagrams.

Preference given to applicants who hold the O.N.C. and/or H.N.C. in Electrical Engineering.

Salary within range—£510 x £20—£630 per annum, Schedule D, Grade 6, N.J.B. Conditions.

Applications to the Establishment Officer, The North Western Electricity Board, Cheetwood Rd, Manchester 8, by 11 June, 1955.

FOURTH ASSISTANT ENGINEER, SUB-AREA TECHNICAL ENGINEER'S DEPARTMENT, MANCHESTER

Applicants should have a wide knowledge of high voltage substation equipment and be familiar with switchgear applications and the associated protective gear problems. The successful applicant will also be required to supervise commissioning tests on the equipment, and should have experience in the Test Department of an Electricity Undertaking.

Preference given to applicants who hold the H.N.C. in Electrical Engineering, or its equivalent, and experience in a drawing office or in a manufacturer's works will be an additional qualification.

Salary Scale: £715 x £15—£760 per annum, Grade L.13, N.J.B. Conditions.

Applications to Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 11 June, 1955.

DISTRICT COMMERCIAL ENGINEER, BOLTON DISTRICT

Duties will include organisation and control of all commercial staff and functions in the District; supply of information and advice to Consumers on electricity utilisation, tariffs, terms, apparatus and all matters concerning electricity services; organisation and supervision of maintenance work on Consumers' premises including emergency services, routine testing and repair of domestic appliances; control of a large Contracting Section; control of Service Centres and Exhibitions; supervision of Consumer records. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £1,110 x £30—£1,200 per annum, Grade G.2, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George Rd, Bolton, by 11 June, 1955.

FOURTH ASSISTANT ENGINEER (TESTING) SUB-AREA ENGINEER'S DEPARTMENT, STALYBRIDGE

Applicants should have a sound practical knowledge of meter and instrument technology. Experience in the commissioning and maintenance of protective gear is also desirable. Preference given to applicants who hold the H.N.C. in Electrical Engineering.

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Salary Scale: £675 x £15—£720 per annum, Grade K.13, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 3 Sub-Area, The North Western Electricity Board, Union St, Oldham, by 11 June, 1955.

FOURTH ASSISTANT ENGINEERS (SYSTEM PLANNING), SUB-AREA TECHNICAL ENGINEER'S DEPARTMENT, PRESTON

Applicants should have had experience in planning and estimating for extensions of H.V. and M.V. networks, substation design and network calculations, and should possess some knowledge of protective equipment. Preference given to holders of a degree or H.N.C. in Electrical Engineering.

Salary Scale: £675 x £15—£720 per annum, Grade K.13, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune St, Preston, by 11 June, 1955.

SECOND ASSISTANT DISTRICT ENGINEER, BURNLEY DISTRICT

Duties will include assistance in the operation, maintenance and construction of underground and overhead mains, substations and transformers, and general mains and standby duties.

Preference given to applicants who are Corporate or Graduate Members of the Institution of Electrical Engineers, or who possess the H.N.C. in Electrical Engineering.

Salary Scale: £755 x £15—£800 per annum, Grade F.7, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee St, Blackburn, by 11 June, 1955.

THIRD ASSISTANT ENGINEER (PLANNING) SUB-AREA ENGINEER'S DEPARTMENT, HAZEL GROVE

Applicants should have had experience in protective gear application, system calculations, preparation of specifications and general technical investigations. Preference given to applicants who hold the H.N.C. (or equivalent) in Electrical Engineering.

Salary Scale: £715 x £15—£760 per annum, Grade H.10, N.J.B. Conditions.

THIRD ASSISTANT DISTRICT ENGINEER (DISTRICT INSTALLATION INSPECTION ENGINEER), NEW MILLS DISTRICT

Applicants should have had experience in the testing and inspection of all classes of electrical installations, routine meter fixing procedure and in office organisation in connection with installation inspection and meter fixing.

Salary Scale: £635 x £15—£680 per annum, Grade E.9, N.J.B. Conditions.

Application forms for the above posts can be obtained from the Sub-Area Manager, No. 7 Sub-Area, The North Western Electricity Board, Chapel St, Hazel Grove, Stockport, and must be returned by 11 June, 1955. (T 81)

ELECTRICAL ENGINEERS (Distribution)

required by the Central Electricity Board, Malaya. Salary scale (including expatriation pay and present temporary allowance at rate for single men) equivalent to £1,197 rising to £2,100 a year. Commencing salary according to qualifications and experience. Additional temporary allowances totalling £210/£399 a year (married men), and £301/£630 (family men). Option of appointment either (*a*) on agreement for three years with prospect of permanency or (*b*) on contract for three years with gratuity of £200/£280 a year. Opportunity of terminating appointment after one year's service. Free passages. Liberal leave on full salary. Candidates must have had sound training in electrical and mechanical engineering with experience in the operation of medium Electricity Supply Undertakings and possess a competent knowledge of the maintenance of high and low tension overhead and underground a.c. distribution systems and substation plant. They should preferably be Corporate Members or Graduates of the Institution of Electrical Engineers or possess degrees or other qualifications carrying exemption from the Institution's Graduate examination. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40440/EE. (T 76)

THE ELECTRICITY CORPORATION OF NIGERIA

has the following vacancies on its staff in Nigeria.

All salaries carry, in addition, a generous expatriation allowance. Some posts are pensionable. Others are on Contract terms and are subject to an addition of 10% on the stated basic salary together with a gratuity payable on completion of satisfactory service and calculated at £37 10s. for each completed three months of service.

Free passages for man and wife and assisted passages or U.K. maintenance allowance for two children up to 18 years of age. Free quarters with basic furniture, low income tax, home leave on full pay. Candidates must pass a medical examination. Wives do not accompany their husbands on first appointment but follow shortly thereafter subject to accommodation being available. A clean and valid U.K. Driving Licence is essential.

ACCOUNTANTS. Qualified Accountants aged 25 to 35 years. Starting salary £920 and upwards to £1,300 according to age and experience. Posts are on contract terms for one or two tours.

ELECTRICAL ENGINEERS. Corporate members of I.E.E. for senior posts at salaries in range £760 to £1,300 with prospects of further advancement; and a few posts as Grade II Engineers, minimum qualification H.N.C., at salaries £985 to £1,090.

MECHANICAL ENGINEERS. Corporate members I.MECH.E., for senior posts and H.N.C. for Grade II posts; salaries as for Electrical Engineers above.

Application Forms and Conditions of Service from Liaison Officer, 11 Manchester Sq, London, W.1. (T 49)

CENTRAL ELECTRICITY AUTHORITY

South Western Division

TECHNICAL STAFF VACANCIES

(*a*) ASSISTANT MAINTENANCE ENGINEER (Mechanical)—Plymouth "B" Generating Station. N.J.B., G8, £755/£800.

(*b*) GENERAL ASSISTANT ENGINEER (Maintenance)—East Yelland Generating Station. N.J.B. G12, £595/£640.

Superannuation Scheme.

Applicants for (*a*) must have had a thorough practical mechanical engineering training, and considerable experience in the maintenance of turbines, boilers and auxiliary plant. Corporate membership of the Institution of Mechanical Engineers or equivalent an advantage.

For (*b*) should have had a sound general and technical education and training. Possession of the Ordinary or Higher National Certificate in Mechanical and/or Electrical Engineering considered an advantage.

Applications on Form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 13 June, 1955. (T 59)

INSPECTOR OF WORKS (Electrical)

required by the Uganda Government Public Works Department for one tour of 30/36 months on contract renewable by mutual agreement. Salary (including inducement pay and present temporary allowance of 10%) £1,003 rising to £1,280 a year. Initial salary according to age and experience. Provident Fund. Free passages. Liberal leave on full salary. Candidates, age 30 to 45, must have served a full apprenticeship and must hold C. and G. Electrician's Extra Certificate Course "C" or O.N.C. in Electrical Engineering. They must have had experience of (*a*) the installation of electrical machinery and equipment in hospitals, public buildings, industrial premises, etc., and (*b*) the maintenance and operation of electrical machinery, switchgear, protective devices, etc., in industrial premises. They must be conversant with the various electricity safety rules and regulations and be capable of initiating safety systems. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40818/EE. (T 77)

CENTRAL ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of Service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.MECH.E. for posts (*a*) an advantage.

(*a*) ASSISTANT SHIFT CHARGE ENGINEER
GROVE ROAD GENERATING STATION
Vacancy No. 55/399

Sound engineering and technical training necessary with practical experience in Generating Station operation. Salary—Class F, Grade 9=£708. 15s. per annum.

(*a*) SHIFT CHARGE ENGINEER
HAMMERSMITH GENERATING STATION
Vacancy No. 55/400

Applicants should have a sound technical training and practical experience in the operation and maintenance of Boilers, Turbines and E.H.T. Switchgear. Salary—Class D, Grade 7=£708. 15s. per annum.

THIRD ASSISTANT ENGINEER (SECTION)
TRANSMISSION DEPARTMENT
Vacancy No. 55/401

Applicants should have had experience in the maintenance of H.V. Switchgear, Transformers, Overhead Lines and Cables, and should preferably be Corporate Members of the I.E.E. or hold equivalent qualifications. Salary—Class AX/EX, Grade 3=£918. 15s./£1,170 per annum.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation Hse, Gt. Portland St, W.1, and be received within 14 days of this advertisement. (T 73)

WARWICKSHIRE EDUCATION COMMITTEE

MID-WARWICKSHIRE COLLEGE OF FURTHER EDUCATION, WARWICK NEW ROAD, LEAMINGTON SPA

Principal: H. M. Marklew, M.SC., A.M.I.E.E.

REQUIRED for September 1955, TEACHER for Electrical Installations and allied subjects to students preparing for City and Guilds examinations. Applicants should have practical and/or teaching experience and technical qualifications. Person appointed will be required to teach on two days a week at the North Oxfordshire Technical College, Banbury.

Burnham Scale salary for Assistants Grade A is payable (£450 per annum rising to £725). Commencing salary depends on previous service, including industrial experience, and war service. Applications, giving full details, should be made at once to the Principal, together with copies of recent testimonials and the names of those persons to whom reference may be made. No forms will be issued.

N. A. Y. YORKE-LODGE,
County Education Officer.
(T 45)

CENTRAL ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the following posts:

GENERAL ASSISTANT ENGINEERS
CLIFF QUAY, LITTLE BARFORD AND PETERBOROUGH GENERATING STATIONS
Salary £475 x £15—£520 per annum.

The duties of the successful applicants will include assisting in the Control Room on shift and other operation and investigation duties.

Preference will be given to applicants who have had previous experience in a Generating Station upon similar work and who have had technical training to Ordinary National Certificate standard or equivalent in Electrical Engineering.

Applications giving details of age, qualifications, experience and present position should be submitted to the Controller, Central Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, not later than 18 June, 1955.

W. N. C. CLINCH,
Controller.
(T 58)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
Lochaber Area

ELECTRICIAN required. Wages and working conditions in accordance with N.J.I.S. for Electricity Supply Industry. Application, stating age and experience to: Area Manager, North of Scotland Hydro-Electric Board, Bank St, Fort William, within fourteen days of the publication of this advertisement. (T 61)

DIRECT ENTRY SCHEME
(Royal Military College of Science)

THE War Office invites applications from young men for permanent regular commissions in the ROYAL ENGINEERS, the ROYAL CORPS OF SIGNALS and the ROYAL ELECTRICAL AND MECHANICAL ENGINEERS through the Direct Entry Scheme (Royal Military College of Science).

Successful candidates will be called up in September, 1955, and will be granted National Service Commissions after the normal training (approximately six months). They will enter the College to read for the London University external B.SC. degrees in Engineering or General Science in October, 1956, and will be granted Regular Commissions after two years at the College. No Fees are payable.

The scheme offers the certainty, subject to satisfactory work, of a Regular Commission and of a free education to Honours Degree Standard.

Applicants must:

(*a*) have been born between 1 Mar., 1936, and 1 Mar., 1938.
(*b*) have passed before Sept., 1955, or be exempt from, the intermediate examination in science of London University required for admission to an external degree course in General Science or Engineering.
(*c*) possess at least the minimum qualifications for entry to an external degree course of London University.
(*d*) be medically fit.
(*e*) pass the Regular Commissions Board interview.

Full details may be obtained from the War Office (PA6/4), London, S.W.1. Applications can be accepted up to 15 July, 1955. (T 72)

CITY COUNCIL OF SINGAPORE
Electricity Department

APPLICATIONS are invited for the appointment of a TECHNICAL ENGINEER on 3 years Agreement in the first instance, with prospects of appointment to the permanent establishment on satisfactory completion of the Agreement.

Applicants must (*a*) be Corporate Members of the I.E.E. and (*b*) possess an Engineering Degree. They must have experience in Technical planning and design associated with modern H.P. Steam Power Stations, High Voltage Networks and Substations, etc., Specifications for steam plant and auxiliary equipment; Generation plant; H.V. Cables, Transformers, Switchgear, etc. Testing of High and Low Voltage Electrical equipment; Network Calculations and protection equipment associated with a large Electricity supply undertaking. Minimum age 30 years.

The salary scale of the post is $1,235 a month rising by annual increments of $45 to $1,325 a month (Malayan Currency). Expatriation and Variable Allowances are also payable. Total emoluments on the salary of $1,235 a month are $1,600 a month (£2,240 per annum) for a single man, $1,690 a month (£2,366 per annum) for a married man with no children and $1,830 a month (£2,562 per annum) for a married man with one or more children.

Partly furnished quarters provided, if available. Free passages for officer appointed and family subject to certain limits. Generous leave. Contributory Provident Fund.

Further details from the Council's London Agents, Messrs Allen and Williams, 1 Victoria St, Westminster, London, S.W.1. Closing date for full applications in duplicate, Tuesday 28 June, 1955. (T 60)

CENTRAL ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

DEPUTY STATION SUPERINTENDENT,
CASTLE DONINGTON POWER STATION
Vacancy No. 80/55/ET

Applicants should preferably be corporate members of the Institution of Mechanical and/or Electrical Engineers and have had experience in a responsible position in a Power Station equipped with High Pressure Plant including Pulverised Fuel Boilers.

Salary will be in accordance with Class L, Grade 3, of the National Joint Board Agreement (£1,395/£1,500 per annum).

Closing date for receipt of applications, 13 June, 1955.

GENERAL ASSISTANT ENGINEER,
NORTHAMPTON POWER STATION
Vacancy No. 84/55/ET

Applications are invited for the above appointment, the duties of which are mainly to assist in the Station Control Room on shift, and to carry out such other operation and investigation duties as may be required.

Applicants should have had some previous experience in a Generating Station and have reached the Standard of the Ordinary National Certificate in Electrical Engineering.

Salary for this appointment will be within Class G, Grade 15 (£475/£520 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 13 June, 1955.

GENERAL ASSISTANT ENGINEERS,
DRAKELOW POWER STATION
Vacancy No. 85/55/ET

General Assistant Engineers are required at Drakelow Power Station where suitable young engineers will be given opportunity to obtain operating and maintenance experience in a large modern Generating Station.

Preference will be given to candidates who hold the Higher National Certificate, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary for this appointment will be within Class J, Grade 16 (£515/£560 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 13 June, 1955.

These appointments will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
2 June, 1955. (T 43)

LONDON ELECTRICITY BOARD

VACANCY—DEMONSTRATOR

APPLICATIONS are invited for the above position for the above position in the Dartford/Erith District of the Board's South Eastern Sub-Area.

Applicants should be suitably qualified, holding the E.A.W. or other approved certificate, including electrical housecraft, and have experience in conducting demonstrations at Service Centres and in general service centre duties. They should also be experienced in advising consumers on the selection and use of domestic electrical appliances, both at the Service Centre and on consumers' premises.

The post is graded within the National Joint Council agreement (Administrative and Clerical Grades) as Grade 1, i.e. £425/£525 per annum, plus the appropriate London Area Allowance.

Application forms obtainable from the Personnel Officer, 46/7 New Broad St, London, E.C.2, to be returned completed within ten days from the date of publication of this advertisement. Please enclose addressed envelope and quote ref.: V/1958/T. (T 80)

LONDON ELECTRICITY BOARD

VACANCIES—ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for various vacancies within the Board. These posts are permanent and superannuable and are graded under Schedule D of the National Joint Board Agreement as Grade 6, £535, 10s./£661, 10s. per annum, inclusive of London Allowance.

South Eastern Sub-Area

DESIGN AND PLANNING BRANCH
AT WOOLWICH, S.E.18
Vacancy No. V/1973/T

Applicants should have had a good general and technical education in building construction and architecture, and experience in the design of small buildings in brickwork and reinforced concrete and the drawing up of specifications.

HAMPSTEAD/WILLESDEN DISTRICT
(DESIGN AND PLANNING)
Vacancy No. V/1972/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in mains records office dealing with systems of all voltages up to 11 kV.

North Eastern Sub-Area

(AT STRATFORD, E.15)
Vacancy No. V/1971/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: engineering drawings, plant lay-out in substations; layouts and site plans of mains work; electrical diagrams.

ST. MARYLEBONE/ST. PANCRAS DISTRICT
(DESIGN AND PLANNING)
Vacancy No. V/1967/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in mains records office dealing with systems of all voltages up to 11 kV.

Northern Sub-Area

DESIGN AND PLANNING BRANCH
(AT ALDERSGATE ST, E.C.1.)
Vacancy No. V/1965/T

Applicants should preferably have had experience in mains recording with a public utility authority, preferably with an Electricity Board, and be able to obtain particulars on site and compile accurate permanent records. Some knowledge of electrical plant layout, building construction and simple reinforced concrete structures would be an additional advantage.

Western Sub-Area

(AT ECCLESTON PLACE, S.W.1)
Vacancy No. V/1947/T

Candidates must have had a good general and technical education, up to National Certificate standard, and must be neat draughtsmen. They should be conversant with the layout of switchgear and transformers and associated equipment up to 11 kV for small substations. They should also be conversant with electrical diagrams, mains records, and similar work. Those with good experience in surveying and planning of mains networks would be considered even if having little experience of substation layouts.

North Eastern Sub-Area

WEST HAM DISTRICT
Vacancy No. V/1939/T

Candidates should have had a good general and technical education, up to Ordinary National Certificate standard. They should have had considerable experience in transformer chamber layout, mains records and system diagrams. Knowledge of building construction would be an advantage.

South Eastern Sub-Area

(AT WOOLWICH, S.E.18)
Vacancy No. V/1842/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: drawing office routine, electrical diagrams, obtaining and recording all mains work and plant layout in transformer chambers.

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Western Sub-Area

(AT ECCLESTON PLACE, S.W.1)
Vacancy No. V/1810/T

Candidates should have had a good general and technical education with experience of tracing, lettering, isometric and freehand drawings.

Application forms for these vacancies are obtainable from the Personnel Officer, 46/7 New Broad St, London, E.C.2. Please enclose addressed envelope and quote reference No. of vacancy preferred. (T 90)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Norfolk Sub-Area

Great Yarmouth District
GENERAL ASSISTANT ENGINEER
96/55.R

Candidates should have had a sound general education and technical training and possess the Higher National Certificate in Electrical Engineering or equivalent qualification.

Salary—N.J.B. Class F, Grade 14 (£475/£520).

Apply by letter within 14 days to the District Manager, Eastern Electricity Board, Electric House, Regent Rd, Great Yarmouth, Norfolk.

Northmet Sub-Area Headquarters, London, N.14

TWO SENIOR DRAUGHTSMEN
97/55.R

The successful candidates will be required to supervise staff engaged on the layout of switchgear, transformers and associated equipment for outdoor and indoor type substations up to 33 kV.

Salary—N.J.B. Schedule D, Grade 5 (£640/£740) plus London Allowance.

Apply by letter within 14 days to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14.

Suffolk Sub-Area

Stowmarket District
FIRST ASSISTANT COMMERCIAL ENGINEER
95/55.R

Candidates must have a good general and technical education and should preferably possess a qualification not less than the Higher National Certificate in Electrical Engineering. The selected candidate would be responsible to the District Commercial Engineer over the whole commercial field including sales and commercial development, the preparation of estimates for all types of industrial, agricultural and domestic installations and such general consumer advisory service as is necessary in this connection.

Salary—N.J.B. Class E, Grade 6 (£755/£800).

Apply by letter within 14 days to the District Manager, Eastern Electricity Board, 25 Ipswich Rd, Stowmarket, Suffolk. (T 38)

NORTH EASTERN ELECTRICITY BOARD

Wear Sub-Area

APPLICATIONS are invited for the following appointments:

CLERK OF WORKS to supervise construction and maintenance of buildings and general civil engineering works in the Sub-Area.

Salary, Schedule A, Class L, Grade 14 £675/£720, N.J.B. conditions of service.

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER, Consett District. Duties will include commercial and domestic development and application of electricity to farming. Graduate membership I.E.E. and/or H.N.C. desirable.

Salary, Schedule A, Class E, Grade 9, £635/£680, N.J.B. conditions of service.

Applications stating age, training, qualifications and experience to be received by the Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (T 93)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments which are superannuable and subject to medical examination.

FOURTH ASSISTANT ENGINEER in the Technical Section, No. 1 Sub-Area Headquarters, 24 Hatton Garden, Liverpool 3.

Salary £715/£760 per annum (N.J.B. L/13).

Some experience in the commissioning of protective systems and testing of equipment advantageous but not essential if suitable technical qualifications are held.

Application forms obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3.

Closing date: 20 June, 1955.

COMMERCIAL ASSISTANT (TECHNICAL) in the Southport District.

Salary £475/£520 per annum (N.J.B. E/13).

Applicants should preferably have the Ordinary National Certificate in Electrical Engineering or a similar qualification.

Duties include estimating for contracting work and advising consumers on electricity supply matters and appliances.

Standard application forms obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3.

Closing date: 20 June, 1955. (T 88)

CITY OF CARDIFF EDUCATION COMMITTEE

Llandaff Technical College

Principal: J. Cotterell,
M.I.E.E., A.I.MECH.E., A.M.I.PROD.E.

GRADE "A" ASSISTANT TEACHER required for 1 Sept., 1955, to teach Electrical Installation subjects, both Theory and Practice, to Course B and C standard of the City and Guilds of London Institute. Ability to teach Radio Servicing will be an advantage.

Candidates should possess a Higher National Certificate in Electrical Engineering and/or City and Guilds in Electrical Installation Work. Practical experience in the Electrical Installation Trade is an essential, and teaching experience will be an advantage.

Salary in accordance with the Burnham (Further Education) Report, 1954. Assistant Grade "A" £450 by £18 to £725; additional training and graduate allowances, where applicable.

Application forms and further particulars may be obtained from the undersigned and should be returned not later than 18 June, 1955.

ROBERT E. PRESSWOOD,
Director of Education.

City Hall,
Cardiff. (T 94)

COUNTY BOROUGH OF ROTHERHAM

Education Committee

ROTHERHAM TECHNICAL COLLEGE

Principal: G. E. Cooke, M.A.(CANTAB.), A.M.I.C.E.

DEPARTMENT OF ELECTRICAL ENGINEERING AND PHYSICS

APPLICATIONS are invited for appointment as ASSISTANT LECTURER in Electrical Engineering.

The Department prepares students for Higher National Certificates in Electrical Engineering and External Degrees of London University.

Candidates should possess a degree or equivalent qualification and should preferably have had teaching and industrial or research experience. Experience in light current work is desirable, but not essential.

Salary will be in accordance with the Burnham Technical Report of 1954, Grade A or B, according to qualification and experience. Duties to commence on 1 Sept., 1955, is possible.

Application forms may be obtained from the undersigned to whom they should be returned as soon as possible.

R. BLOOMER,
Director of Education.

Education Offices,
Rotherham. (T 92)

CENTRAL ELECTRICITY AUTHORITY

North West Merseyside and N. Wales Division

VACANCY No. E.142/181/T.—ASSISTANT SHIFT CHARGE ENGINEER, Blackburn Generating Station. Salary £715/£760 (G.9).

Vacancy No. E.142/186/T.—ASSISTANT SHIFT CHARGE ENGINEER, Agecroft "B" Generating Station, Pendlebury, near Manchester. Salary £715/£760 (G.9).

Vacancy No. E.142/187/T. — SHIFT CHARGE ENGINEER, Leigh Generating Station. Salary £595/£640 (B.7).

Vacancy No. E.142/189/T.—ASSISTANT SHIFT CHARGE ENGINEER, Huncoat Generating Station, Accrington. Salary £675/£720 (F.9).

Apply to Divisional Secretary, Central Electricity House, 825, Wilmslow Rd, Manchester 20, before 11 June. Quote Vacancy No. (T 78)

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

Sheffield North District

SECOND ASSISTANT DISTRICT ENGINEER

APPLICANTS must have technical qualifications equivalent to Corporate Membership of the Institution of Electrical Engineers, with training and experience fitting them to take charge of substation, underground and overhead mains construction, and maintenance work up to 11 kV and system operations up to 66 kV in a heavy industrial and densely developed residential area surrounded by a rural area. The successful candidate will be required to take charge of one of the two operational units in the District.

Salary—N.J.B. Class K, Grade 7, £975/£25/£1,050 per annum.

Sheffield South District

SECOND ASSISTANT DISTRICT ENGINEER

Applicants must have technical qualifications equivalent to Corporate Membership of the Institution of Electrical Engineers, with training and experience fitting them to take charge of substation, underground and overhead mains construction, and maintenance work up to 11 kV and system operations up to 66 kV in a heavy industrial and densely developed residential area surrounded by a rural area. The successful candidate will be required to take charge of one of the two operational units in the District.

Salary—N.J.B. Class H, Grade 7, £840/£20/£900 per annum.

Mexborough District

FIRST ASSISTANT DISTRICT ENGINEER

Applicants must have technical qualifications equivalent to Corporate Membership of the Institution of Electrical Engineers, and be experienced in substation and overhead and underground mains construction, also maintenance at system voltages up to 11 kV. They must be capable of planning and estimating development schemes, and be experienced in the operation of an extensive mainly overhead distribution system at 66 kV, 11 kV and M.V.

The successful candidate will be expected to take charge of all engineering in the district during the absence of the District Engineer.

Salary—N.J.B. Class F, Grade 5, £840/£20/£900 per annum.

Sheffield South District

FOURTH ASSISTANT DISTRICT ENGINEER

Applicants should preferably hold Technical Qualifications equal to the Higher National Certificate in Electrical Engineering, and should have had experience in construction and maintenance work, and be able to carry out operation duties on 11 kV and L.V. overhead and underground mains in a district containing a heavy industrial and densely developed residential area surrounded by a rural area.

Salary—N.J.B. Class H, Grade 11, £675/£15/£720 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 16 June, 1955.

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No. 5 (Wakefield) Sub-Area

THIRD ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

Applicants should have had a sound practical training and experience in the operation and maintenance of H.V. and L.V. underground networks, and in substation plant and ancillary equipment. Experience in 33 kV and 66 kV substation maintenance will be an advantage.

Salary—N.J.B. Class K, Grade 10, £790/£20/£850 per annum.

Barnsley District

THIRD ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training and considerable experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants should hold a current driving licence, be prepared to reside in the district, and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers, or who hold equivalent qualifications.

Salary—N.J.B. Class F, Grade 9, £675/£15/£720 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 16 June, 1955.

No. 4 (Leeds) Sub-Area

THIRD ASSISTANT ENGINEER
(METERS, TESTING AND PROTECTION)

Applicants should be Graduate Members of the Institution of Electrical Engineers or possess equivalent qualifications.

Experience in a Class A Meter Testing Station and the Commissioning of Industrial Metering Combinations is essential.

Experience of H.V. fault location and protective gear testing will be an advantage.

Salary—N.J.B. Class K, Grade 10, £790/£20/£850 per annum.

THIRD ASSISTANT ENGINEER
(METERS, TESTING AND PROTECTION)

Applicants should be Graduate Members of the Institution of Electrical Engineers or have exempting qualifications, and have a sound practical training in the electrical industry.

Experience of the commissioning of substations up to 66 kV, routine maintenance of protective equipment, and testing of new distribution network equipment for heavy industrial and rural areas is essential.

Experience of fault location and some knowledge of metering will be additional qualifications.

Salary—N.J.B. Class K, Grade 10, £790/£20/£850 per annum.

Wetherby District

THIRD ASSISTANT DISTRICT ENGINEER

Applicants should possess a good general and technical education and training and have had experience in the construction, operation and maintenance of E.H.T. and L.T. overhead and underground distribution systems in a mixed urban and rural district.

The successful applicant will be stationed at the Garforth Office and should be prepared to reside in that district.

Salary—N.J.B. Class E, Grade 9, £635/£15/£680 per annum.

Leeds District

GENERAL ASSISTANT ENGINEER
(COMMERCIAL)

Applicants should have had a sound technical and practical training and be competent to advise consumers in all matters regarding the utilisation of electricity. They should be familiar with the I.E.E. and Supply Regulations and be in possession of the Higher National Certificate in Electrical Engineering or an equivalent qualification.

Salary—N.J.B. Class J, Grade 17, £475/£15/£520 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Brambope, near Leeds, not later than 16 June, 1955.

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No. 6 (Hull) Sub-Area

Bridlington District

THIRD ASSISTANT DISTRICT ENGINEER
(DRIFFIELD)

Applicants should have had a sound practical training with experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and ancillary equipment.

Applicants should hold the Higher National Certificate in Electrical Engineering or equivalent qualification.

The successful candidate will be required to reside in Driffield and undertake standby duty.

Salary—N.J.B. Class E, Grade 9, £635/£15/£680 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston-upon-Hull, not later than 16 June, 1955. (T 82)

CENTRAL ELECTRICITY AUTHORITY

Southern Division

POOLE GENERATING STATION
CHARGEHAND INSTRUMENT MECHANIC

APPLICANTS must have ability to supervise skilled tradesmen and have experience in the maintenance of Power Station instruments, including Multelecs, flowmeters, pyrometers and automatic controls. Some knowledge of electronics preferred.

The rate of pay will be 4s. 4d. per hour for a 44-hour 5-day week and conditions of employment will be in accordance with the N.J.I.C. Agreement for the Electricity Supply Industry. Superannuation Scheme, good canteen facilities and social club.

Applications should be made in writing to: Station Superintendent, Poole Generating Station, Rigler Rd, Hamworthy, by 10 June, 1955. (T 46)

THE EAST MIDLANDS ELECTRICITY BOARD

STAFF VACANCY
THIRD ASSISTANT DISTRICT ENGINEER
BURTON DISTRICT

APPLICATIONS are invited for the appointment of a Third Assistant District Engineer in the Burton District of the Derby and Burton Sub-Area.

The salary and conditions for the post will be in accordance with the National Joint Board Agreement, Class F, Grade 9 (£675/£720).

Candidates should have a technical qualification equivalent to the Higher National Certificate in Electrical Engineering, and have practical experience of the maintenance of switchgear, transformers, and auxiliary equipment, with some experience in the operation of urban and rural distribution systems.

The successful candidate will be required to undertake standby duties, and to reside in or near Burton.

Applications, stating age, qualifications, experience and present position should be addressed to The Manager, Burton District, Derby and Burton Sub-Area, Church Croft, Horninglow St, Burton-on-Trent, and be received within 14 days of this advertisement. (T 87)

INSTRUCTOR

(Electrical Trades)

required for the Government Technical Institute, British Guiana, for appointment on contract for three years in first instance. Salary (including present temporary allowance of £72 a year) in scale equivalent to £697 rising to £972 a year. Gratuity at the rate of £140/£202 a year. Free passages. Liberal leave on full salary. Candidates must hold a C. and G. Full Technological Certificate or H.N.C. in Electrical Engineering and have at least five years' industrial experience including electrical installation work. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/30229/EE. (T 69)

SOUTH WESTERN ELECTRICITY BOARD

1. SECOND ASSISTANT DISTRICT ENGINEER (PLANNING) EXETER

SALARY N.J.B. Class E, Grade 7, £715/£760 per annum.

Duties include forward planning for development within the District; preparation of detailed plans for new schemes, including capital applications; serving of statutory notices, etc., for new development and reinforcements. Possession of H.N.C. is desirable.

2. THIRD ASSISTANT DISTRICT ENGINEER (OPERATION AND MAINTENANCE) PENZANCE

Salary N.J.B. Class F, Grade 9, £675/£720.

Duties involve operation, maintenance and construction work in the Penzance area. All round experience of work on both HV and LV overhead and underground networks and substations is essential, and the possession of H.N.C. is desirable.

3. ENGINEERING DRAUGHTSMAN, EXETER

Salary N.J.B. Schedule D, Grade 6, £510/£630.

Duties include the preparation of engineering drawings, substation buildings site and layout plans, mains and statistical records. Knowledge of overhead line design is essential and the possession of the O.N.C. and survey and profiling experience would be an advantage.

Application forms for posts 1 and 3 obtainable from the District Manager, 46 North St, Exeter, and for post 2 from the Manager, Cornwall Sub-Area, Pool, Redruth, are to be returned by 15 June, 1955. (T 95)

LONDON ELECTRICITY BOARD

ENGINEERING DRAUGHTSMEN

VACANCIES exist for Engineering Draughtsmen as follows:

North Eastern Sub-Area

West Ham District
(Ref. V/1939/T)

Candidates should have had a good general and technical education, up to Ordinary National Certificate standard. They should have had considerable experience in transformer chamber layouts, mains records and system diagrams. Knowledge of building construction would be an advantage.

ST. MARYLEBONE/ST. PANCRAS DISTRICT,
Design and Planning Branch
(Ref. V/1967/T)

HAMPSTEAD/WILLESDEN DISTRICT,
Design and Planning Branch
(Ref. V/1972/T)

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV.

Northern Sub-Area

Design and Planning Branch
(Ref. V/1965/T)

Applicants should preferably have had experience in mains recording with a public utility authority, preferably with an Electricity Board, and be able to obtain particulars on site and compile accurate permanent records. Some knowledge of electrical plant layout, building construction and simple reinforced concrete structures would be an additional advantage.

North Eastern Sub-Area

(Ref. V/1971/T)

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: engineering drawing; plant layout in substations; layouts and site plans of mains work; electrical diagrams.

The posts are graded under Schedule D of the National Joint Board agreement as Grade 6—£535. 10s./£661. 10s. per annum, inclusive of London Allowance, and are superannuable.

Application forms for the aforementioned vacancies obtainable from Personnel Officer, 46/7, New Broad St, London, E.C.2, to be returned completed within 10 days of the publication date of this advertisement. Please enclose addressed envelope and quote appropriate reference of vacancy preferred. (T 37)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

Hemel Hempstead District
ASSISTANT ENGINEER (COMMERCIAL)
99/55.N.

Candidates must have had experience of tariffs associated with industrial and commercial consumers and must be able to advise on and estimate for installations in such consumers' premises including power factor correction and thermal storage heating. A knowledge of street lighting would be an advantage and preference will be given to candidates holding the Higher National Certificate in Electrical Engineering.

Salary—N.J.B. Class E, Grade 9 (£635/£680).

Apply by letter, within 14 days, to the District Manager, Eastern Electricity Board, 44 Marlowes, Hemel Hempstead, Herts.

Fens Sub-Area Headquarters

Cambridge
FOURTH ASSISTANT ENGINEER
100/55.R.

Candidates should have had a good general and technical education. The duties of the post will include surveying, preparation of specifications of overhead lines, matters arising from the negotiating of wayleaves, etc.

Salary—N.J.B. Class H, Grade 13, (£595/£640).

Apply by letter, within 14 days, to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge.

Northmet Sub-Area

St. Albans District
SENIOR SALES REPRESENTATIVE (Ref. 514)
101/55.R.

Candidates must be of good address and have had sound practical training, with experience in electrical installation work for domestic, commercial and industrial premises. A good knowledge of electric water heating and ability to prepare wiring specifications and estimates is essential.

Salary—N.J.C. Grade 2 (£525/£585).

Apply by letter, within 14 days, to the District Manager, Eastern Electricity Board, 107 St. Peter's St, St. Albans, Herts. (T 74)

ELECTRICAL SUPERINTENDENT

required by the Gambia Government for two tours of 18 to 24 months with prospect of permanency. Salary scale (including expatriation pay) £750 rising to £1,170 a year. Outfit allowance £60. Free passages for officer and wife and assistance towards cost of children's passages or grant up to £132 annually for their maintenance in U.K. Candidates should have served a regular apprenticeship to electrical engineering and possess a National Certificate or equivalent. They should have had works experience and have subsequently served with a public supply company. They must be capable of the testing and calibration of single and three-phase kWh meters and the general supervision of a meter testing department. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40720/EE. (T 48)

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

STATION SHIFT CONTROL ENGINEER is required at Hams Hall "A" Power Station, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade J10, commencing at £755 per annum.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualifications an advantage.

Apply quoting Vacancy No. 970MD on form A.E.6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 13 June, 1955. (T 89)

LONDON ELECTRICITY BOARD

ENGINEER (OPERATION AND MAINTENANCE)

APPLICATIONS are invited for the above position in the Hackney/Stoke Newington District of the Northern Sub-Area.

Applicants should have had a sound technical education up to at least National Certificate standard, preferably being corporate members of the I.E.E., and possess a practical experience of all branches of engineering work associated with the organisation of a District Distribution department, particularly in regard to mains and substations work on D.C. and A.C. systems.

The post is graded under Schedule A of the National Joint Board Agreement as Class F, Grade 10, £666. 15s. per annum rising to £714. per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46/7 New Broad St, E.C.2, to be returned completed within ten days from the publication of this advertisement. Please enclose addressed envelope and quote ref.: PER/V/1954/T. (T 91)

AIR MINISTRY

require MECHANICAL and ELECTRICAL ENGINEERS in Works Department for design, operation and maintenance of mechanical and electrical services on R.A.F. stations at home and overseas and Civil Aviation stations. Appointments in two grades (*a*) Main Grade, salary scale £1,118/£1,463, (*b*) Assistant Grade, £729 to £1,118. Starting pay according to qualifications and experience. Salaries somewhat lower in provinces. Candidates should be age 25 or over. Appointments non-pensionable but with long-term possibilities. Special allowance up to £1,500 a year according to location payable in addition to salary during overseas service. Candidates must be natural-born subjects of natural-born British parents. Minimum qualifications and experience for both grades of posts: (i) (*a*) University degree or equivalent diploma in electrical and/or mechanical engineering and at least a two-year apprenticeship, or (*b*) Graduate or Corporate Membership of the Institutions of Mechanical or Electrical Engineers with appreciable electrical engineering experience and at least three-year apprenticeship and (ii) employment in responsible position for minimum of three years with well-established engineering concern providing wide experience in electrical and mechanical engineering practice. Application forms quoting reference D240/5A from M.L.N.S., Technical and Scientific Register (K), 26 King St, London, S.W.1. (T 71)

UNIVERSITY OF BIRMINGHAM

DEPARTMENT OF ELECTRICAL ENGINEERING

LECTURER in Electrical Engineering, Grade II (£650 x £50—£1,350 according to qualifications and experience). There is scope for teaching and participation in research in fields depending upon the candidate's special interests, but some preference for a candidate with industrial experience in electrical machinery or power.

Three copies of applications, with the names of three referees, should reach the Registrar, The University, Birmingham 15, not later than 10 June, 1955.

G. L. BARNES,
Secretary.

The University,
Birmingham, 15.
May, 1955. (T 70)

A VACANCY occurs in the Transformer Department for a TECHNICAL CORRESPONDENT and ESTIMATOR. The post is a senior one and applications are invited from men with experience in the preparation of tenders for both the home and export markets for all classes of transformers. Apply giving details of experience and salary required to Employment Manager, Messrs Johnson and Phillips Ltd., Victoria Way, Charlton, London, S.E.7. (T 35)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

CANADA

The following Senior and other Engineers are required by a firm of Consulting Engineers in Canada for Industrial work in that country:

ENGINEERS

Electrical Mechanical
Mechanical Services
Structural

Civil and Reinforced Concrete

Applicants should have had experience in the design and detailing of works in connection with Heavy Engineering, Steelworks, Foundries, Light Engineering and similar.

The engagement will be for a minimum period of two years with an option to continue at the end of that time. Fares will be paid out and return fares at conclusion of contract if applicants desire. Assistance given in arranging housing accommodation.

Salaries in accordance with those set out by the Association of Professional Engineers.

Write stating age, experience in detail, whether married or single and if married, number of children to:

Box 203, Glovers Advertising, 351 Oxford St, London, W.1. (T 57p)

APPLICATIONS are invited for the position of TEMPORARY CLERK OF WORKS in the Transmission (Construction) Department.

Applicants should have had considerable experience in placing mass and reinforced concrete and general building work.

Salary will be £11 per week.

Applications in writing to Divisional Establishments Officer, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham. Please quote Vacancy No. 83/55/ET. (T 29)

A QUALIFIED DEVELOPMENT ENGINEER is required for interesting work on electro-mechanical instrument equipment. Applicants should hold Higher National Certificates in electrical and/or mechanical engineering. Preferably with some experience of airborne equipment operational requirements, and should be able to develop experimental apparatus to production design form. Apply, stating age, qualifications, experience and salary required, to—Box No. 4569, Electrical Times. (T 101)

A LEADING firm in the Lighting Industry has a vacancy for a first class DESIGNER in its Lighting Department. Work will be concerned with special decorative fittings designs in both contemporary and traditional styles, and new lighting developments. The post offers attractive prospects and salary for men with initiative, imagination, and a sound experience in this field. Apply in writing quoting Ref. D.O. to the Staff Manager, The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. (T 33)

BRUSH ELECTRICAL ENGINEERING CO., LTD., Loughborough, Leics, has a vacancy for a SENIOR SWITCHGEAR SERVICE ENGINEER. Applicants should have served a good apprenticeship and be familiar with the construction and test of switchgear up to 33 kV. Minimum technical standard O.N.C. in Electrical Engineering. Preference will be given to those having experience of similar work. The successful applicant will be expected to travel and work anywhere in the United Kingdom. This post offers excellent opportunities to a capable man having drive and initiative. Good salary allowances and conditions including non-contributory superannuation and annual bonus. Please reply with full details to the Chief Personnel Officer. (T 34)

CABLE JOINTERS and CABLE JOINTERS MATES required by North London Electrical Contractors. Apply—Box No. 4565, Electrical Times. (T 99)

CENTRAL ELECTRICITY AUTHORITY, Research Laboratories, Leatherhead, have vacancies for JUNIOR CHEMISTS. Candidates should have Higher National Certificate or equivalent qualification in Chemistry. Duties include general analytical work and the chemical aspects of combustion and corrosion. Salary within Grade 5, National Joint Board—£475/£650 per annum according to qualifications and experience. Applications stating age, qualifications, experience, present position and salary to D. Moffat, Director of Establishments, Winsley St, London, W.1, by 30 June, 1955. Quote Ref.: AE/602. (T 97)

CHIEF TRANSFORMER TEST ENGINEER, required to take full responsibility for Test and Inspection Dept. Salary commensurate with qualifications and experience. Apply in confidence to the Managing Director, Transformers (Watford) Limited, Sandown Rd, Watford, Herts. (T 24)

DRAUGHTSMEN required. Electro-Mechanical work of varied nature. Knowledge of circuitry an advantage. Apply (quoting REF. STK. 196), The General Electric Co., Ltd., Union Works, East Lane, Wembley. (T 52)

DRAUGHTSMEN for Low Voltage Electrical Distribution Equipment including Joint Boxes and Terminations. 5-day week. Pension Fund. Apply in writing, stating age, details of experience and salary expected, to the Personnel Officer, W. T. Henley's Telegraph Works Co., Ltd., Gravesend. (T 30)

DRAUGHTSMEN required for work on all types of Transformers, up to 3,000 kVA including Regulators, Test Equipment, Cubicles, etc. Good conditions. Apply in writing to Personnel Officer, Foster Transformers Ltd., South Wimbledon, S.W.19. (T 27)

DRAUGHTSMEN required Electro-Mechanical work of varied nature. Knowledge of circuitry an advantage but not essential. Salary in accordance with age and experience. Pension scheme. Write giving details of experience, etc. (quoting Ref. STK.199), The General Electric Co., Ltd., Union Works, East Lane, Wembley, Middlesex. (T 103)

ELECTRICAL ENGINEER. An engineer is to be appointed to the Head Office staff of a Birmingham company, operating factories equipped with heavy plant for the manufacture of metals. Suitable practical experience is necessary and a University degree desirable. Five-day week, sports club, canteen. Holidays this summer by arrangement. Applicants should give full details of their careers and state the salary desired. All replies will be treated as strictly confidential. Box No. A.9, T. and G., 167 High Holborn, London, W.C.1. (T 32)

ELECTRICAL Engineers require ASSISTANT CONTRACTS MANAGER, applicants must have previous experience of managing large and varied contracts of all kinds. Write giving details of experience and salary required to—Box No. 4561, Electrical Times. (T 66)

ELECTRICAL AND MECHANICAL SHIFT TECHNICIANS required for Suez Canal Zone for electrical and mechanical maintenance work and emergency repairs both at Power Stations, Consumers' premises or on transmission and distribution system. All-round experience as Power Company's Maintenance Engineer required. Salary not less than £1,250 per annum. Good conditions of service. Furnished accommodation. Age up to 50. Write Box E.T. 517, c/o 191 Gresham House, Old Broad St, E.C.2. (T 62)

ELECTRICIANS. G. R. Marson Limited, 110-116 Queen Victoria Rd, Coventry, require a number of electricians for long term contracts. (T 96)

Applications are invited for the post of:

ASSISTANT TECHNICAL EDUCATION OFFICER

who will be responsible for the supervision of the technical content of training schemes in the Companies of Brookhirst Switchgear Ltd., Chester, and the Igranic Electric Co., Ltd., Bedford, and who will be required to lecture on electric motor control gear to Junior Engineers and Engineers under training in the two Companies.

It is desirable that applicants should be technically qualified to at least H.N.C. in Electrical Engineering, have a sound knowledge of control gear and preferably have had some teaching experience. The post is pensionable and the salary will be commensurate with qualifications and experience.

Applications should be sent to the Technical Education Officer, Metal Industries Electrical Division Ltd., Northgate Works, Chester. (T 75p)

ELECTRICAL or MECHANICAL ENGINEER required with Mine Winder experience, for interesting technical sales work (inside). Situation North East London. Salary according to qualifications and experience. Excellent working conditions and five-day week. Apply—Box No. 4567, Electrical Times. (T 100)

ELECTRICAL ENGINEERING ASSISTANT required for steelworks in Sheffield area. Applicants to be familiar with E.H.T. system operation, protection and metering, and competent to assist in design and layout of substations and E.H.T. system extensions up to 11 kV. Applicants should write, stating qualifications, experience, etc., to Labour Manager, Samuel Fox and Co., Ltd., Stocksbridge Works, near Sheffield. (T 55)

EXCELLENT opportunities offered by a leading electrical engineering company in London to keen men between 20/25 years of age as JUNIOR SALESMEN in London and the Home Counties. Write with full details of age, experience, qualifications and salary required to Box No. 8749, c/o Charles Barker and Sons Ltd., 31 Budge Row, London, E.C.4. (T 53)

JUNIOR ELECTRICAL ENGINEERS are invited to apply for vacancies in our London, Weybridge and Provincial Offices providing experience in Consulting work with a view to future appointments on our staff at home and abroad. Preference given to men with University Engineering Degree and a Post Graduate Apprenticeship with leading manufacturer of (*a*) EHV switchgear, (*b*) light current and telephone-type control and indicating equipment, (*c*) hydro-electric plant. Apply with full particulars to Ref.: MVR, Kennedy and Donkin, Alliance Hse, 12 Caxton St, London, S.W.1. (T 25)

MANAGER required, preferably with electrical or civil engineering training, eventually with some chemical experience to take charge of well-established business in full activity with office in London. The company specialises in the maintenance of electrical transmission lines and particularly in the reimpregnation of wood poles already implanted. The process is patented and extensively used in Great Britain and all other countries on the Continent and in America. It prolongs the life of wood poles considerably. The applicant must have administrative qualifications and sales experience and be able to follow contacts with the Electric Supply Companies, the G.P.O. and Railways. Age—40 to 45. The Manager will be responsible for site work and will be required to undertake a considerable amount of travelling. This appointment offers an interesting position with an assured future to the right man. Write giving full details of experience, copies references and salary to—Box No. 4563, Electrical Times. (T 86)

JOHNSON AND PHILLIPS LTD.

CABLE WORKS MANAGER

Johnson and Phillips Ltd. require a Manager for their Paper and Rubber Cable Works. Those interested should send full details of their training and career to the Managing Director. All correspondence will be treated in absolute confidence.

Johnson and Phillips Ltd.,
Charlton, London, S.E.7.

(T 85p)

OVERHEAD LINE ENGINEER required by Consulting Engineers for supervision of power distribution schemes in Scotland. Applicants should have had experience in the construction of wood-pole lines up to 33 kV. Applications, giving details of technical training and experience should be sent to Messrs Kennedy and Donkin, 3 North Charlotte St, Edinburgh 2. (T 28)

POWER CABLE ENGINEERS required with experience of all types of cable installation work including overhead power lines; a knowledge of railway electrification would be an advantage. The appointments will be for contract work either at home or overseas. Position permanent with contributory pension scheme. State age, qualifications, experience and salary required. London area.—Box No. 4559, Electrical Times. (T 65)

REPRESENTATIVE required for Wiring Accessories, calling on Architects, Electricity Authorities, Contractors and Wholesalers in Birmingham and Midland area. Pension scheme operative. Apply by letter to the Manager, The Edison Swan Electric Co., Ltd., Swan House, 10 Hospital St, Birmingham 19. (T 56)

REPRESENTATIVE required for Wholesale Electrical House with connection in North Kent area. Subject to satisfactory trial this will lead to a position as Manager of a Depot with good prospects. Applicant should state full particulars as to age, experience, etc., when an interview will be arranged. All replies treated in strict confidence. Reply—Box No. 4549, Electrical Times. (T 36)

SALES ENGINEER to call on Architects, Consultants, Surveyors, etc., for Midlands area. Remuneration commensurate with the high qualities this position demands. Car provided, expenses paid, superannuation scheme in operation. Applications should be addressed for the confidential attention of Mr H. Finch, director, Volex Electrical Products Ltd., Salford, 6. (T 83)

SENIOR ELECTRICAL DRAUGHTSMAN, H.N.C. standard preferably with works experience and all-round training for E.H.T. Power Station layouts, cabling, protection systems, etc., and diagrams. London office. 5-day week. Free lunches. 1955 holiday. Pension Fund. Write Box E.T. 511, c/o 191 Gresham House, Old Broad St, E.C.2. (T 54)

CAPACITOR DEPARTMENT

ENGINEER for Design and Development of Power Capacitors and ancillary apparatus.

SALES ENGINEER for London and S.E. England.

DRAUGHTSMAN, preferably with some experience with Power Capacitors.

Apply:

Technical Director,
Bryce Electric Construction Co., Ltd.,
Kelvin Works,
Hackbridge, Surrey.

(T 31p)

SALES ENGINEER to call on Architects, Consultants, Surveyors, etc., in Yorkshire and North East Coast area. Remuneration commensurate with the high qualities this position demands. Car provided, expenses paid, superannuation scheme in operation. Applications should be addressed for the confidential attention of Mr H. Finch, director, Volex Electrical Products Ltd., Salford, 6. (T 84)

TECHNICAL WRITER required by large precision instrument Company with offices in Leyton.

Applicants should be familiar with Electronics and Mechanics and able to write technical service literature. The position can be progressive for the right man and the initial salary would be commensurate with experience.

Applications, which can be made in the strictest confidence, giving full details of experience, age and salary required, should be addressed to The Personnel Manager, Kelvin and Hughes Limited, New North Rd, Barkingside, Essex. (T 98)

TECHNICAL ASSISTANTS required to act in Research, Development, and Inspection Problems in modern Switchgear factory. Applicants must have Science, Engineering Degree or Diploma. Housing assistance can be given to successful applicants. Write giving particulars of experience and qualifications to the Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. (T 63)

UNILEVER LIMITED requires an ELECTRICAL POWER ENGINEER for an Oilseed Crushing and Compound Feeding Stuffs Mill at Avonmouth. The engineer appointed will be responsible for the installation, operation and maintenance of high and medium voltage distribution systems together with associated transformers, switchgear, motors, control gear, etc. The preparation of schemes and specifications for the electrical side of factory extensions would be an essential part of the duties involved. The maximum demand of the factory with extensions now in progress will exceed 6 MW.

Candidates should be about 30 to 35 years of age, they must possess a university degree in Electrical Engineering and/or Corporate Membership of the I.E.E. and must have had practical training and subsequent experience in the field of electrical power engineering as applied to a large process factory. A contributory Superannuation and Widows' Pension Scheme is in operation and the salary will be in accordance with age and experience.

Applications giving full details should be addressed to: Personnel Division (WAD 86), Unilever Ltd., Unilever House, E.C.4. (T 40)

WEST Surrey Electrical Contractors require the services of a thoroughly competent TRADESMAN to control installation activities and supervise wiring staff. Permanent and progressive post for man of proved ability and initiative. Able to drive. Apply in confidence stating age, qualifications, salary required and enclosing copies of testimonials to—Box No. 4541, Electrical Times. (T 26)

APPOINTMENTS WANTED

NOW in Pakistan: BRITISH ELECTRICAL ENGINEER, 37, B.SC.(ENG.), A.M.I.E.E., experienced power station commissioning, estimating and supervision of switchgear and cable installation contracts. Shortly available.—Box No. 4519, Electrical Times. (T 21)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (T 3)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (T 4)

INDUSTRIAL and DOMESTIC MOTOR REWINDS and REPAIRS speedily carried out. All work guaranteed. N. France Electronics Ltd., 110 New Road Side, Horsforth, Leeds. Horsforth 2871. (T 6)

LET US SOLVE YOUR BREAKDOWN PROBLEMS, repairs speedily carried out by experts. Collection and Delivery by our own transport. A. T. Robinson, Electrical Power Engineers, The Green, Southall, Middx. Southall 3494/5/6. (T 5)

WANTED

BRANDT AND O'DELL, Consulting Engineers, will be pleased to receive manufacturer's catalogues covering all aspects of building construction, finishes, electrical installations, heating and ventilation. Brandt and O'Dell, Grosvenor Gardens House, London, S.W.1. (T 64)

WANTED, ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (T 2)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (T 1)

PATENTS

THE Proprietor of British Patent No. 636775, entitled "Improvements in adjustable supports for lamps or the like," offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, 14 E. Jackson Blvd, Chicago 4, Illinois, U.S.A. (T 23)

THE Proprietor of British Patent No. 666264, entitled "Wire Stripper," offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, 14 E. Jackson Blvd, Chicago 4, Illinois, U.S.A. (T 22)

FOR SALE

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—Chi. 5105, 67 Rothschild Rd, W.4. (T 8)

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (T 9)

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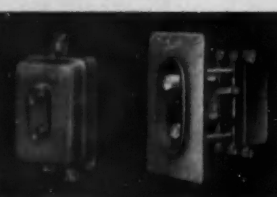

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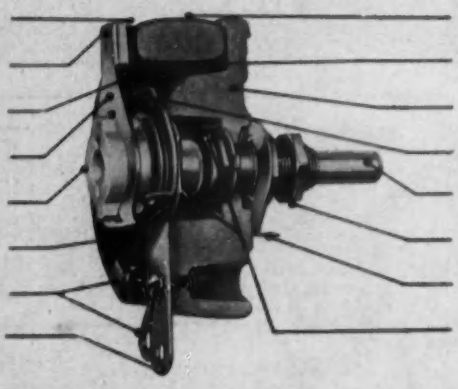

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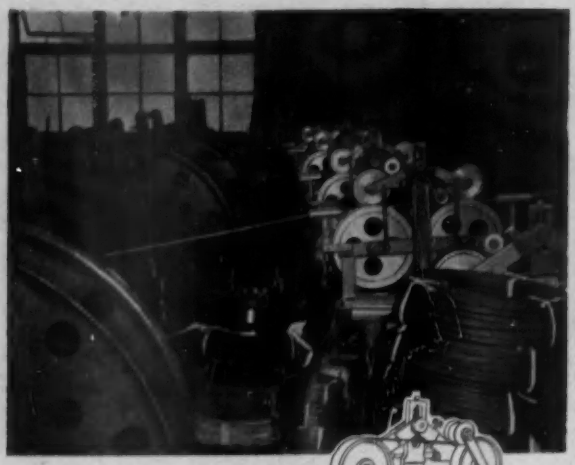

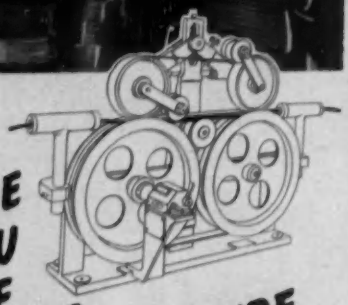

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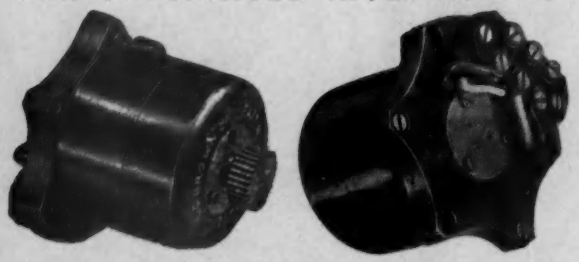

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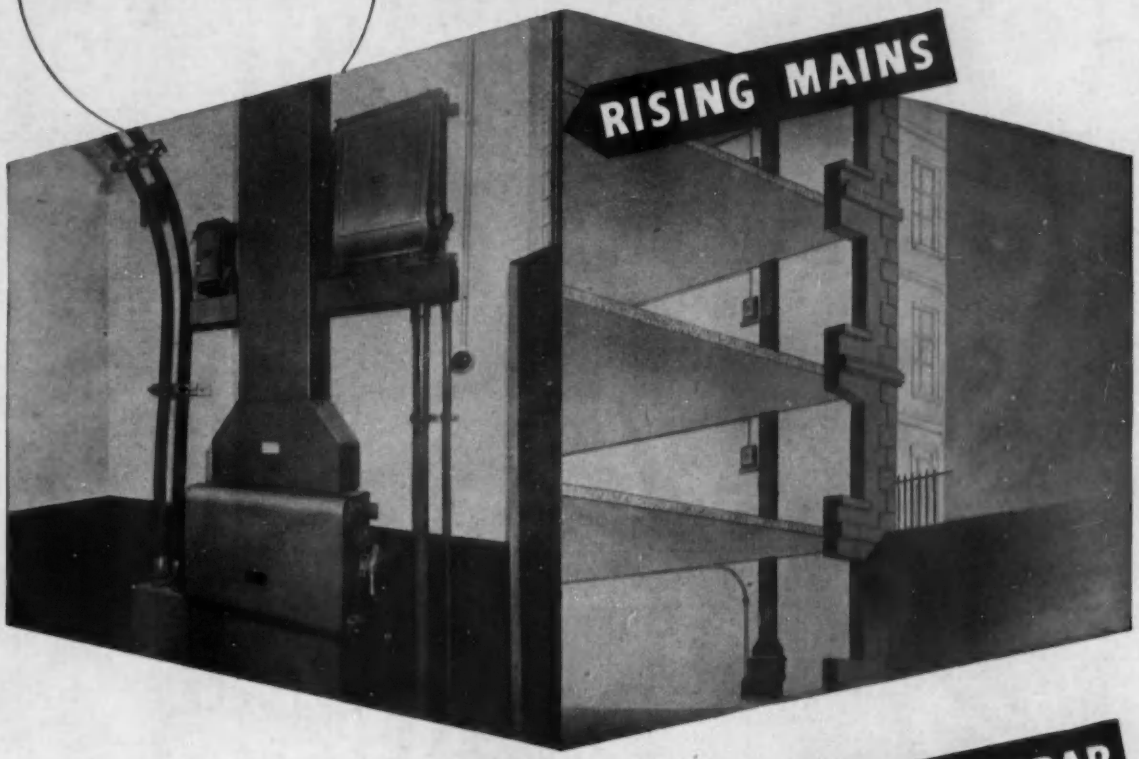

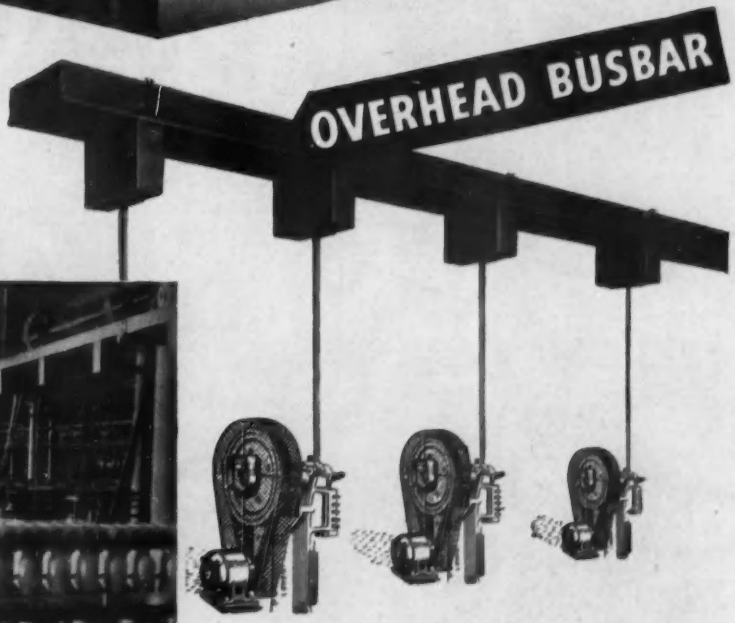

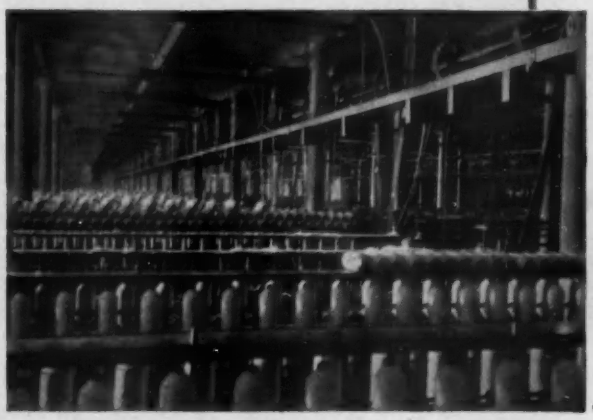

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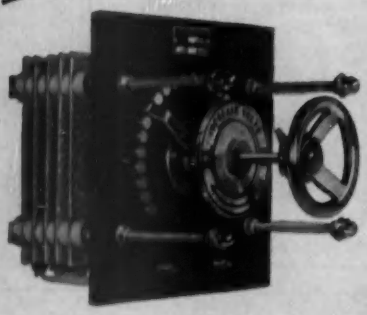

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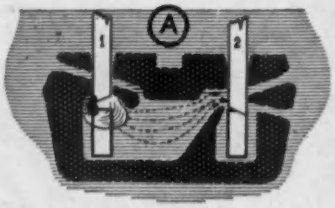
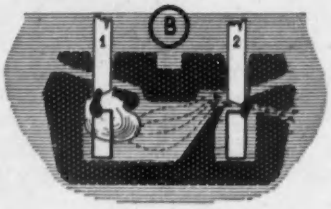
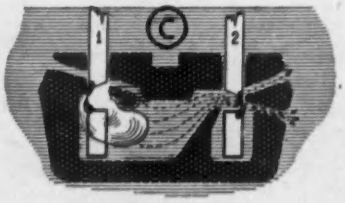
(Patents pending)



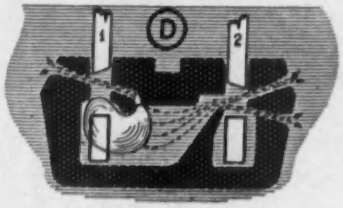
No. 1 electrode leads by ¼ cycle. Pressure trapped except for constricted relief at No. 2 in advance of arc.



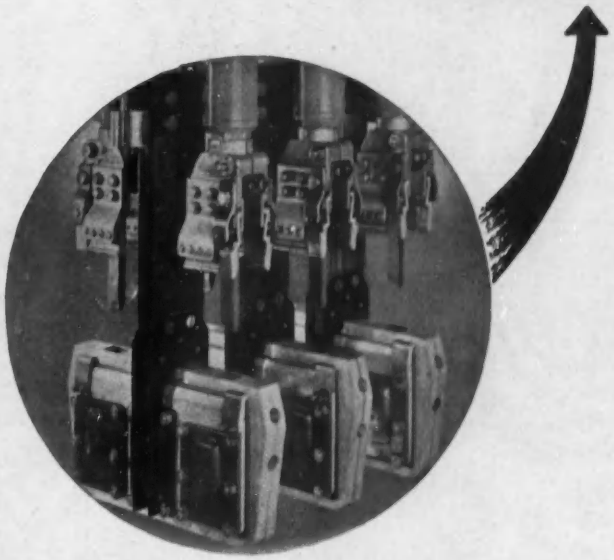
No. 2 electrode breaks contact. Arcing restricted and displaced by pressure.



Arc severed at current zero by high pressure clean oil



Arc-trap scoured by exhausting pressure and rapidly refilled with clean oil.



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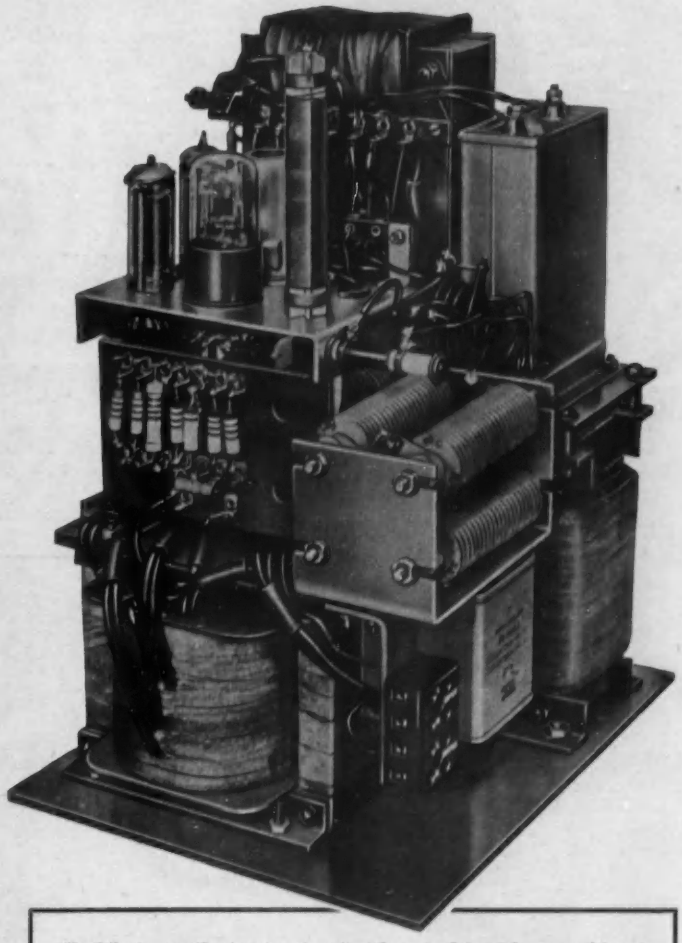

The following specification gives the salient features of the performance of the set

Mains frequency	**40-60 cycles/sec.**
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Input Voltage	195-260 volts
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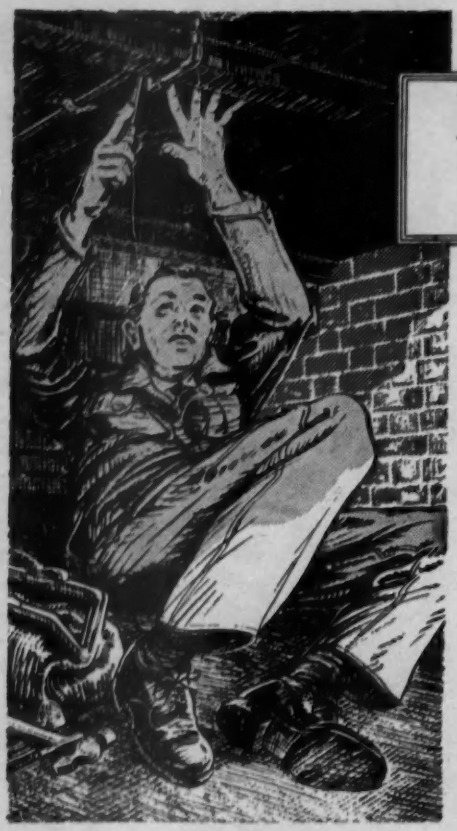
VR/8



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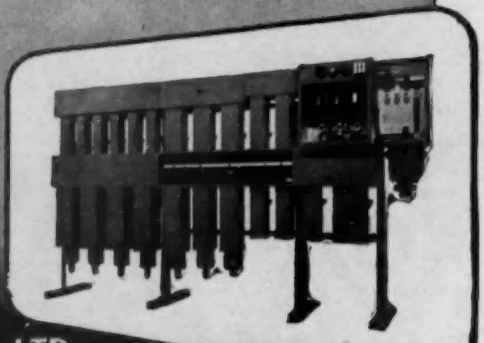

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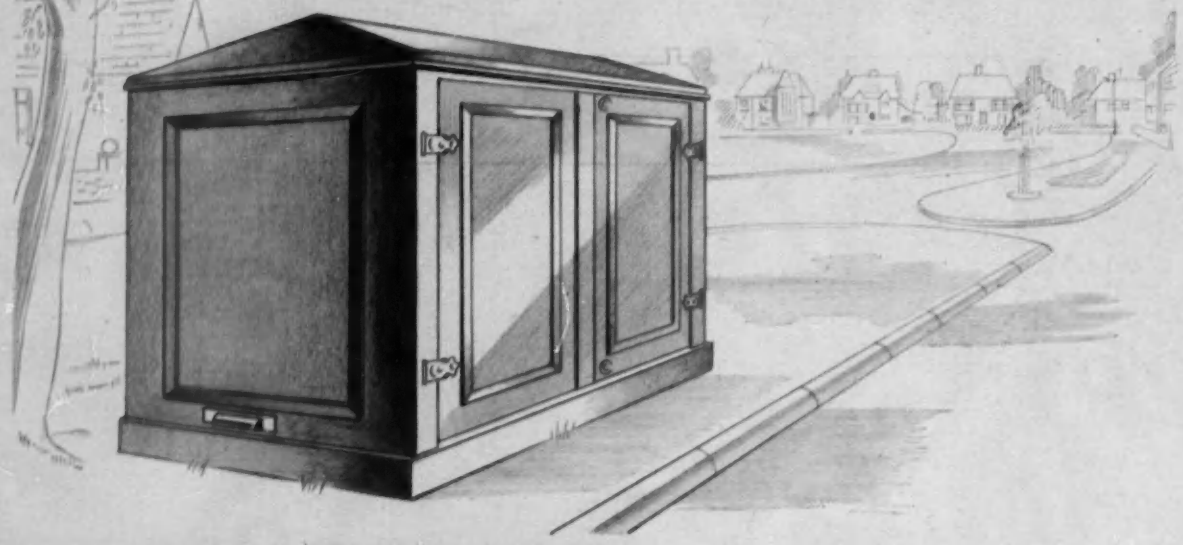

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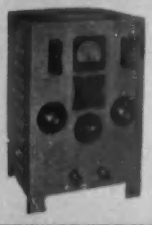

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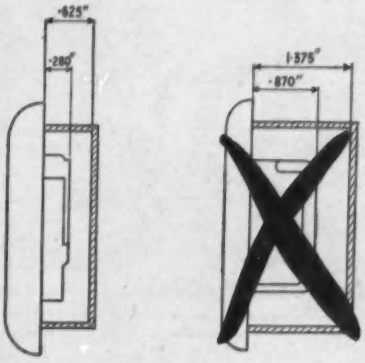

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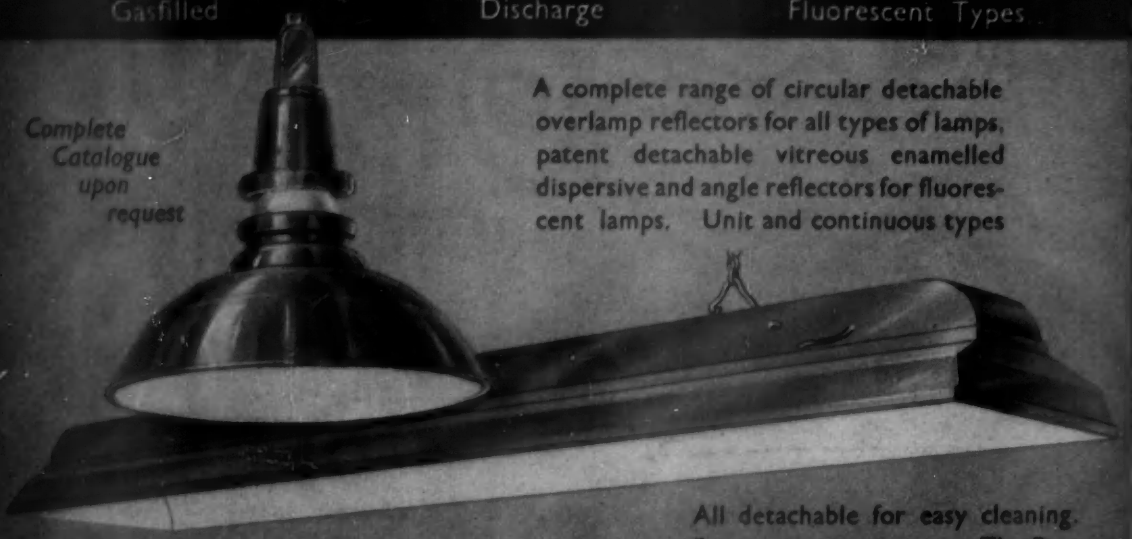

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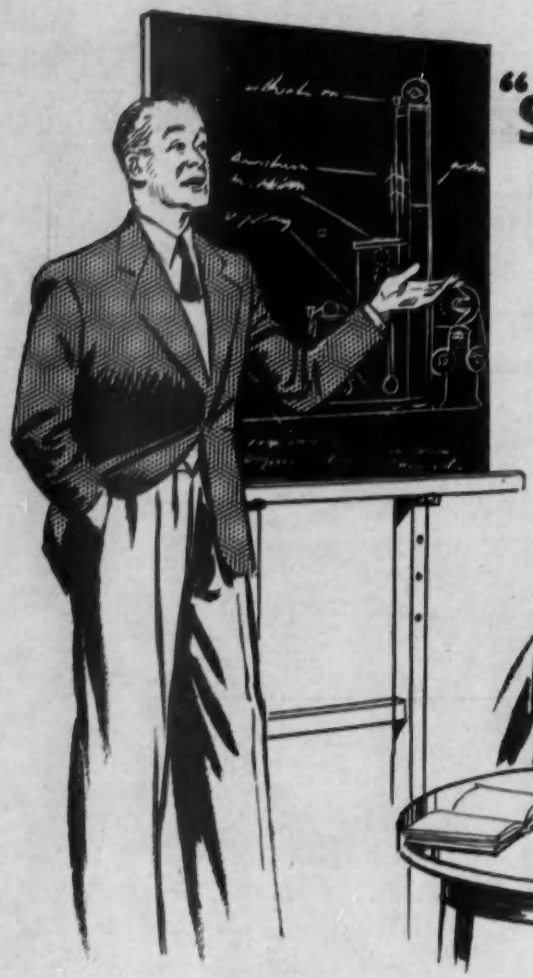

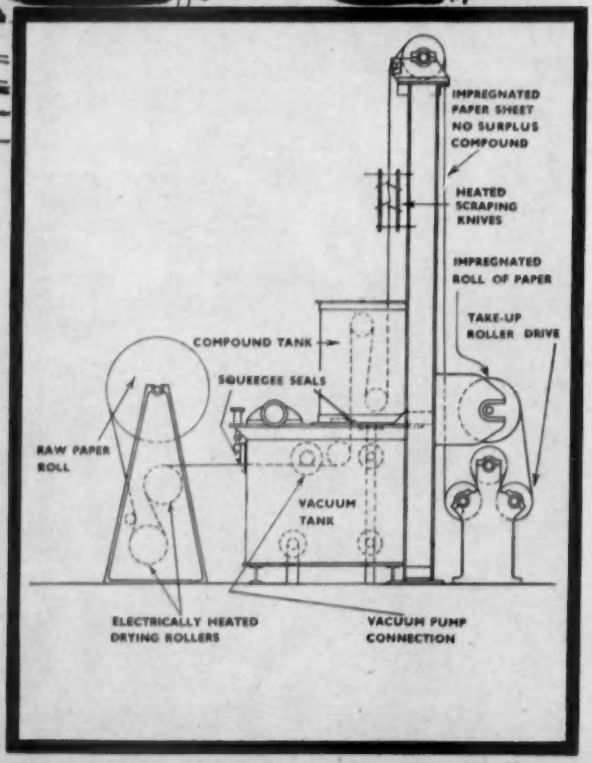

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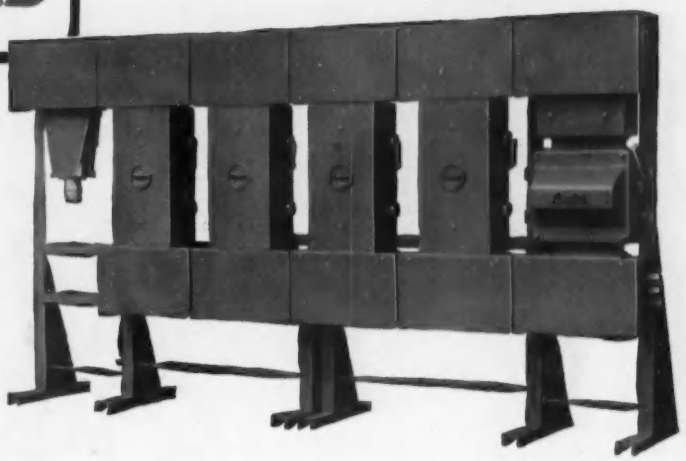
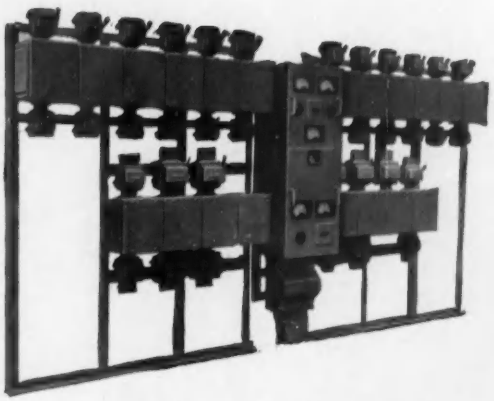
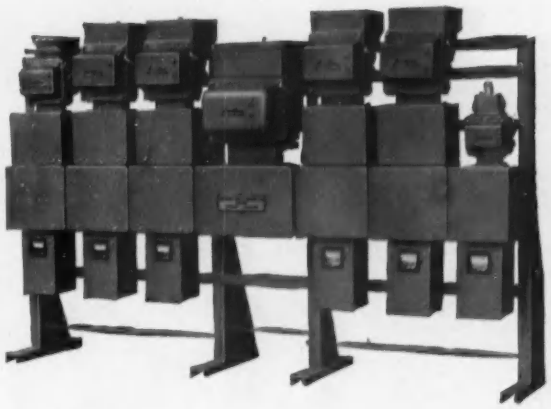


Change-over switchboard arranged so that any of the four outgoing circuits can be switched to either side of the busbars. Supplied through the British Thomson-Houston Co. Ltd., (London) to the British Sugar Corporation at Peterborough.

UNIT TYPE SWITCHBOARDS



Switchboard supplied through B. French Ltd., and installed at the Carrickfergus, Co. Antrim plant of Courtaulds Ltd.



Unit type switchboard supplied to Ericsson Telephones Ltd., Beeston, Nottinghamshire.

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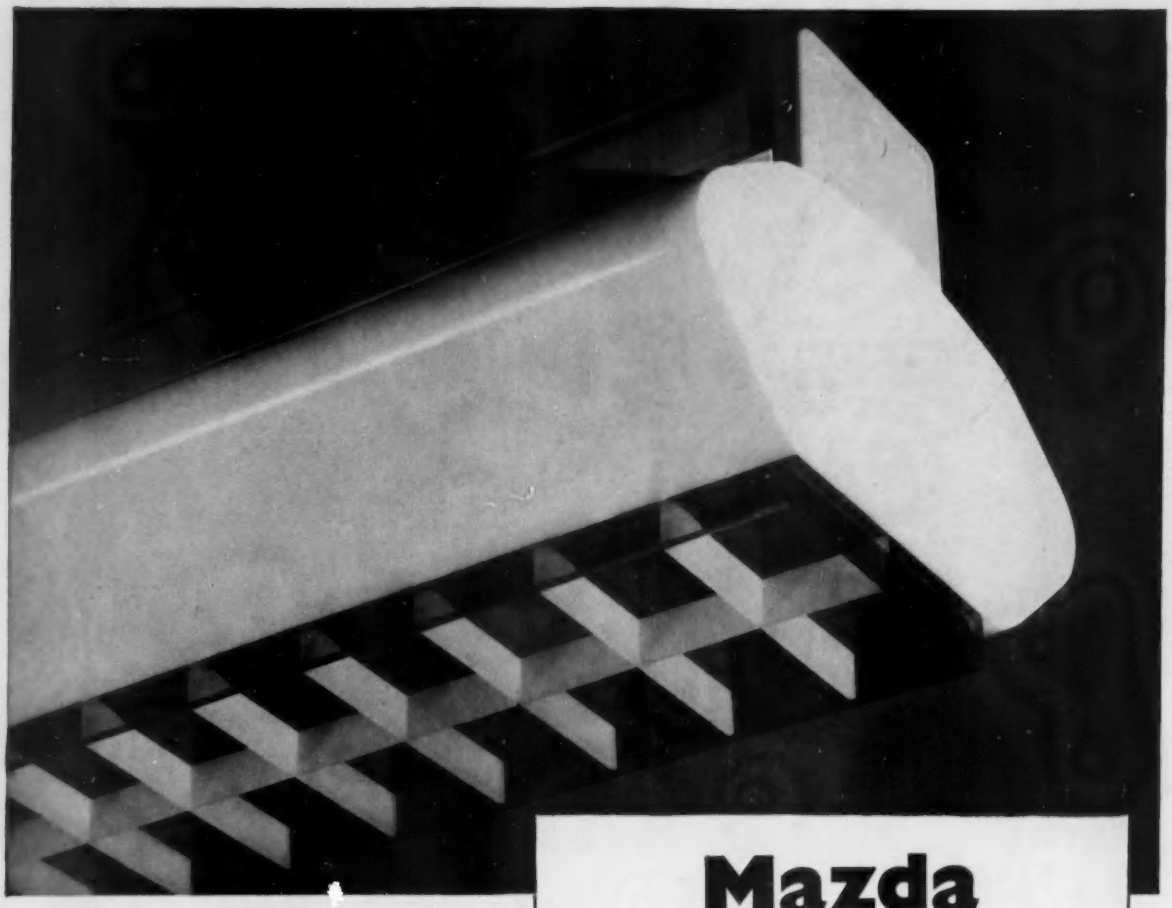

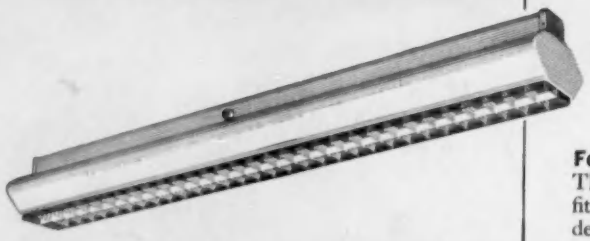

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